

LICHENS OF THE LOWER OZARK REGION OF MISSOURI AND ARKANSAS

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INTRODUCTION

This is a preliminary treatment of the lichen flora of the Lower Ozark region of Missouri and Arkansas. This region includes nine counties with all or part of their area contained within the surface watersheds of the Current, Eleven Point, and Jack's Fork Rivers or the recharge areas of the major springs associated with these rivers. These counties are Carter, Dent, Howell, Oregon, Reynolds, Ripley, Shannon, and Texas counties in Missouri and Randolph County in Arkansas (Figure 1).

The Lower Ozark section of the Ozark Natural Division (Thom & Wilson, 1980) lies at the heart of the Missouri portion of the Ozark uplift, and includes the oldest continually exposed land in midcontinental North America. Portions of the Ozarks have been continuously available for terrestrial life since the late paleozoic, some 225 million years ago.

This ancient landscape consists of a diverse, ruggedly dissected topography that is largely wooded, with oak, oak-pine, and pine woodlands predominating on excessively drained, cherty upland soils. Springs, caves, bluffs, sinkholes, glades, fens, narrow ridges, and high-gradient streams are characteristic features in the region. Dolomitic rocks are the most common bedrock type in the region, resulting in an extensive karst landscape. An average of one billion gallons of water flows daily from more than 80 named springs along the region's rivers, and more than 800 caves have been documented in the region. Other bedrock types common in the region include sandstone, localized lenses of chert, and igneous rocks.

The Lower Ozark region contains the largest units of contiguous native vegetation and highest levels of endemic, rare, or disjunct biota of any region in Missouri, and has been designated by The Nature Conservancy as one of 75 regions on the planet having critical biodiversity values. The combination of an ancient, topographically and geologically diverse landscape and repeated influxes of biota from diverse regions in response to climatic change have resulted in a unique juxtaposition of organisms from spatially and temporally disparate biogeographic regions. Many species not typically found in midcontinental North America have adapted to suitable microhabitats and survived in the region through changes of climate and process regime.

The Lower Ozark region is rich in endemic species, as well as in populations of species that are either significantly disjunct from their main range or at the edge of their range. An astonishing 17% of the vascular flora of the region is disjunct or attains the limit of its range in the Interior Highlands (The Nature Conservancy 1994). Additionally, a number of vascular taxa, while locally common, are endemic to the Ozarks, or, for plants such as *Scutellaria bushii* and *Tradescantia longipes*, are essentially endemic to the Lower Ozark region.

The Ozarks have been poorly explored from a biological perspective. While this is true as a general statement, it is even more compelling from the standpoint of cryptogams and invertebrates. Little lichen work was done in the region prior to field work conducted by Richard Harris, William Buck, Gerould Wilhelm and myself beginning in the 1980's. Hale (1957) compiled the first checklist of corticolous macrolichens in a portion of the Ozarks, stating in his introduction "no professional lichenologist has ever collected in the region". A sober assessment of the current state of lichenological knowledge in the region must explicitly acknowledge that there are many more lichens yet to be documented from the Interior Highlands; preliminary work suggests that there are many undescribed species in the region (Harris and Ladd 2002).

This is a first attempt to circumscribe the lichen biota of the Lower Ozarks, and to provide information about lichen distribution, abundance, and ecology in the region. Many of the treatments are preliminary, and in several cases, as indicated in the text, there is considerable uncertainty regarding the application of a name. Even with these uncertainties, a treatment such as this can be a useful tool in gaining an understanding of the local biota and facilitating information flow, as long as a rigorous consistency of concept is maintained.

In this treatment, a general key is followed by the individual lichen treatments. Lichens are arranged alphabetically by genus, for the most part following Esslinger & Egan (1995). For each genus, there is a heading with the genus, authority, and family, followed by a brief synopsis of diagnostic features. This synopsis pertains only to those members of the genus occurring in the Lower Ozark region, and not necessarily to all members of the genus. Information on morphology, chemistry, and ecology is for the most part derived from Interior Highland material, with emphasis on the Lower Ozarks. In a few instances, I have based my comments on other midwestern material or relied on literature reports for taxa I have not seen, particularly regarding sexual characters for species which are prevailingly sterile in the Lower Ozarks.

For genera with more than one taxon in the Lower Ozarks, a key is provided below the generic synopsis. Following each generic synopsis and key are brief, alphabetically arranged entries for each species in the genus. The accounts have a header line with the species name and authority citation, standard coding acronym used on field data forms in regional ecological projects, and the physiognomic class of the taxon (foliose, fruticose, gelatinous, or squamulose). This is followed by a descriptive account of abundance, distribution, habitat, ecology, and any other information of importance about the lichen, as well as any diagnostic information about chemical constituents. These discussions also include discussions of field identification characteristics and similar species with which the subject taxon may be confused, as well as accounts of related species that occur in the Ozarks but have not been documented from the Lower Ozark region.

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GENERAL KEYS TO LICHENS OF THE LOWER OZARK REGION OF MISSOURI AND ARKANSAS

Synopsis

Key A:	Fruticose lichens	p. 6
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Key to sections

1. Thallus fruticose, in form resembling an erect to pendant shrub, rope, stalk, or strap, with round to flattened branches, generally lacking a distinct lower cortex that is differentiated from the upper cortex
..... **KEY A fruticose lichens**
1. Thallus crustose, foliose, or squamulose, usually flattened, either closely attached to the substrate or with a distinct lower cortex, or flattened, lobe-like, and \pm adnate to the substrate 2
 2. Thallus foliose to squamulose, of \pm flattened, typically horizontally spreading distinct lobes, often with a distinct lower cortex; upper lower surfaces usually different in color and/or structure; rhizines or tomentum often present 3
 3. Thallus foliose, typically of branched, radiating lobes or rosettes
..... **KEY B foliose lichens**
 3. Thallus squamulose, of numerous scattered to contiguous, discrete, often unlobed, squamules
..... **KEY C squamulose lichens**
 2. Thallus crustose, usually closely adherent to the substrate and often nearly inseparable from it; lower cortex lacking; rhizines and tomentum absent 4
 4. Thallus routinely sterile, even in well developed specimens **KEY D sterile crusts**
 4. Thallus fertile, producing ascomata with asci and, usually, ascospores 5
 5. Ascomata on distinct stalks, or slender, stalk-like structures (hyphophores) present ..
..... **KEY E Calicialian lichens**
 5. Ascomata sessile to immersed; hyphophores lacking 6
 6. Ascomata perithecia or perithecia-like, \pm globose and opening by a typically apical pore, the perithecia sometimes closely aggregated
..... **KEY F peritheciate crusts**
 6. Ascomata clearly apothecia, the disk circular to elongate or branched 7

Key to sections (continued)

7. Apothecia elongate or branched, lirelliform to stellate, typically at least twice as long as wide **KEY G lirelliform crusts**

7. Apothecia \pm circular, sometimes slightly irregular in outline, but prevailing isodiametric to less than twice as long as wide
..... **KEY H crusts with round apothecia**

KEY A: FRUTICOSE LICHENS

1. Thallus greenish gray to blue-gray, green, or grayish orange, not gelatinous; stratified with a distinct algal layer; largest branches >0.5 mm wide; photobiont *Trebouxia* 2

2. Thallus branches flattened, not terete 3

3. Thallus grayish to orange, at least locally K⁺ magenta (parietin)
..... *Teloschistes chrysophthalmus*

3. Thallus greenish, K⁻ *Ramalina*

2. Thallus branches thicker, subterete to terete 4

4. Thallus branches with a solid, cord-like center *Usnea*

4. Thallus branches hollow 5

5. Primary squamules absent; cortex lacking, the outer surface dull, appearing cobwebby under magnification; thallus abundantly and repeatedly branched
..... *Cladonia*

5. Primary squamules present; cortex present, the surface at least in part smooth and often \pm lustrous, appearing smooth under magnification, thallus simple to sparsely branched, or if abundantly branched, then squamules present on the branches
..... *Cladonia*

1. Thallus black to dark olive brown, becoming gelatinous when wet, or threadlike and 0.2 mm wide; not stratified with a distinct algal layer; photobiont cyanobacteria or *Trentepohlia* 6

6. Isidiate; main thallus branches >2 mm wide, black, sometimes pruinose, flattened, umbilicate to straplike 7

7. Thallus black, not pruinose, typically subumbilicate *Lichinella nigritella*

7. Thallus grayish pruinose, typically of suberect straplike lobes *Thyrea confusa*

6. Isidia absent; main thallus branches <2 mm wide, brownish to black, never pruinose, filamentous to terete 8

Key A: Fruticose lichens (continued)

- 8. Thallus a felty mat of elongate, remotely branched, terete filaments <0.03 mm diameter, some branches >1 mm long; thallus of fungal hyphae closely enveloping filaments of *Trentepohlia* *Cystocoleus ebeneus*
- 8. Thallus squat, subfruticose, branched, > 0.05 mm diameter, branches < 0.5 mm long; photobiont a cyanobacterium (*Gleocapsa*, *Nostoc*, or cf. *Scytonema*) 9
 - 9. On exposed siliceous rocks; typically associated with *Psorula rufonigra* *Spilonema revertens*
 - 9. On carbonate rocks or at bases of mature trees; not associated with *Psorula rufonigra* 10
 - 10. On exposed carbonate rocks; thallus branches swollen; photobiont *Gleocapsa* . . . *Synalissa symphorea*
 - 10. On or near bases of mature hardwoods in woodlands; thallus branches ± slender; photobiont *Nostoc* *Dendroscocaulon intricatum*

KEY B: FOLIOSE LICHENS

- 1. Thallus gelatinous when wet, black to dark slate gray or brown, lacking a distinct algal layer, upper and lower surfaces similar; photobiont cyanobacterial 2
- 2. Thallus distinctly foliose, attached to the substrate at multiple locations, ± horizontally spreading and appressed to substrate 3
 - 3. Lobes extremely narrow, < 0.2 mm broad *Placynthium*
 - 3. Lobes > 0.2 mm broad 4
 - 4. Thallus dull above, black to brownish or olive; upper surface composed of loosely aggregated hyphae *Collema*
 - 4. Thallus sublustrous above, slate gray to rich brown, upper surface composed of a layer of ± isodiametric cells *Leptogium*
- 2. Thallus subfruticose to squamulose, typically attached to the substrate at a single point, ascending to umbilicate 5
 - 5. Thallus of small subterete branches < 0.6 mm wide *Synalissa symphorea*
 - 5. Thallus of flattened straplike to umbilicate lobes mostly > 1 mm wide 6
 - 6. Thallus of grayish pruinose ± straplike lobes *Thyrea confusa*
 - 6. Thallus epruinose, umbilicate to broadly squamulose *Lichinella nigritella*

Key B: Foliose lichens (continued)

1. Thallus not gelatinous, variously colored, with a distinct algal layer, upper and lower surfaces usually different colors; photobiont various 7
 7. Upper cortex tinted with orange or yellow, ranging from yellow green or sea green to lemon yellow or orange 8
 8. Upper cortex golden yellow to orange, K+ magenta (parietin) 9
 9. Thallus esorediate, closely adnate; rhizines lacking *Caloplaca "squamosa"*
 9. Thallus sorediate, appressed to suberect; rhizines present *Xanthoria*
 8. Upper cortex lemon yellow to yellowish green or sea green, K- 10
 10. Upper cortex lemon yellow (sometimes greenish yellow in extremely shaded populations); lower cortex pale, rhizinate; thallus lobes < 0.4 mm wide *Candelaria*
 10. Upper cortex yellowish green; lower cortex various, but if thallus lobes < 0.5 mm wide then thallus subcrustose and lower cortex lacking rhizines 11
 11. Thallus subcrustose to squamulose-umbilicate, either of discrete, bullate, subumbilicate areoles < 5 mm diameter or with areolate central portions and closely appressed marginal lobes; rhizines lacking 12
 12. Thallus of suberect, swollen, bullate, subumbilicate areoles; lower surface pale brown, corticate *Rhizoplaca chrysoleuca*
 12. Thallus subcrustose, centrally areolate, with appressed lobate margins; lower cortex lacking 13
 13. On siliceous rock; apothecia black; ascospores brownish, 2-celled *Dimelaena oreina*
 13. Substrate various, typically calciferous; apothecia tan to brown; ascospores hyaline, simple *Lecanora*
 11. Thallus foliose, with a distinct rhizinate lower cortex; thallus not areolate ... 14
 14. Thallus loosely adnate and convoluted; medulla bright yellow; lower cortex yellowish *Vulpicida viridis*
 14. Thallus closely adnate, \pm flat; medulla white; lower cortex whitish to tan, brown, or black 15
 15. Lobes broad, apically rounded, some > 3.5 mm wide; upper cortex dull to lustrous 16
 16. Isidiate or sorediate; apothecia rare 17
 17. Isidiate, the isidia sometimes breaking to appear apically sorediate 18

Key B: Foliose lichens (continued)

- 18. Isidia fine, cylindrical; thallus margins ciliate
..... *Parmotrema madagascariaceum*
- 18. Isidia coarse, pustular, appearing apically sorediate with age;
marginal cilia absent *Flavoparmelia*
- 16. Diaspores absent; apothecia common *Flavoparmelia rutidota*
- 15. Lobes narrower and typically more elongate, prevailing < 3.5 mm wide;
upper cortex \pm lustrous *Xanthoparmelia*
- 7. Upper cortex brown, gray, or bluish or greenish gray, without yellowish tints (some species may
have yellow soredia or medullary tissue) 19
- 19. Upper cortex brown to brownish gray, K- 20
- 20. Lower surface tomentose, often felt-like 21
- 21. Lower surface with distinct raised or darkened veins *Peltigera*
- 21. Lower surface lacking raised or darkened veins 22
- 22. Lower surface with abundant small pores; bright yellow soredia present
..... *Pseudocyphellaria aurata*
- 22. Lower surface lacking pores; soredia, if present, not yellow 23
- 23. Thallus lustrous, deep brown, with laminal, flattened, isidia-like lobules;
apothecia on underside of lobe tips *Nephroma helveticum*
- 23. Thallus dull, gray brown, lobules, if present, marginal and not strongly
flattened; apothecia on upper surface 24
- 24. Apothecia without a thalline margin ... *Santessoniella crossophylla*
- 24. Apothecia with a distinct thalline margin 25
- 25. Thallus squamulose to subfoliose, with abundant whitish marginal
zones; hymenium ultimately IKI+ reddish brown (sometimes initially blue
green); ascospore with attenuate apiculus and smooth sheaths
..... *Fuscopannaria leucosticta*
- 25. Thallus foliose, essentially without whitish marginal zones;
hymenium persistently IKI+ blue (only around asci); ascospores with \pm
short apiculus and rough sheaths *Pannaria*
- 20. Lower surface bare or rhizinate, lacking tomentum 26

- 26. Thallus umbilicate and centrally attached or of aggregated, subumbilicate thalli; well-defined branching lobes absent; diaspores absent; perithecia usually present *Dermatocarpon*
- 26. Thallus characteristically foliose, with branched lobes; diaspores present or absent; apotheciate or sterile 27
- 27. Sorediate 28
 - 28. Upper cortex densely pruinose, at least near lobe tips *Physconia*
 - 28. Upper cortex not pruinose 29
 - 29. Lower cortex black *Phaeophyscia*
 - 29. Lower cortex pale 30
 - 30. Thallus lobes minute, < 0.5 mm wide and tightly appressed; well-developed rhizines lacking *Hyperphyscia*
 - 30. Thallus lobes > 0.5 mm wide, adnate but not tightly appressed; well-developed rhizines present *Physciella*
- 27. Not sorediate 31
 - 31. Lobes subterete, tough, always < 0.4 mm wide; rhizines absent; ascospores 2-celled, hyaline *Speerschneidera euploca*
 - 31. Lobes ± flattened, not tough, prevailing > 0.5 mm broad; rhizines present; ascospores brownish, or if hyaline, then simple 32
 - 32. Upper cortex lustrous, not lobulate; marginal dark pycnidia usually common; apothecia marginal to submarginal; ascospores ~~simple, hyaline~~ *Simple, hyaline*
 - 32. Upper cortex dull, typically with abundant lobules; pycnidia, if present, strictly laminal; apothecia laminal; ascospores 2-celled, brown 33
 - 33. Apothecia common; lower surface pale throughout; thallus lobes elongate and uniformly narrow, the margins dissected into linear, ± appressed lobules *Anaptychia palmulata*
 - 33. Apothecia very rare; lower surface dark at center; thallus lobes short and apically broadened, with irregularly dissected lobules ~~*Etiadactylus*~~ *Etiadactylus*
- 19. Upper cortex various shades of gray or blue gray, without brown tints; K- or K+ yellow 34
 - 34. Upper cortex with numerous small white pores *Punctelia*
 - 34. Upper cortex lacking small white pores (sometimes white angular markings or reticulations present) 35

Key B: Foliose lichens (continued)

35. Lobes broad, suborbicular, apically broadened and rounded, usually > 5 mm wide; thallus typically loosely adnate.....*Parmotrema*, *Rimelia*, *Canomaculina* (see key to *Parmotrema* on p. 89)
35. Lobes narrow, linear to slightly expanded, prevailing <5 mm wide; thallus typically closely appressed 36
36. Upper cortex K- (atranorin and thamnolic acid lacking) 37
37. Medulla pigmented yellow or red 38
38. Medulla red; upper cortex epruinose ... *Phaeophyscia rubropulchra*
38. Medulla yellow; upper cortex pruinose, at least near lobe tips
..... *Pyxine*
37. Medulla white 39
39. Thallus shiny dark lead gray, laminally isidiate; lower surface with black tomentum *Coccocarpia palmicola*
39. Thallus lighter gray to brownish, isidia absent (isidia-like lobules sometimes present); lower surface not tomentose 40
40. Upper cortex abundantly pruinose *Physconia*
40. Upper cortex essentially epruinose 41
41. Lower cortex black, at least centrally *Phaeophyscia*
41. Lower cortex pale throughout 42
42. Thallus uniformly appressed and tightly adnate to substrate; rhizines not evident *Hyperphyscia*
42. Thallus appressed, but not inseparably adnate to substrate; rhizines evident 43
43. Lobes to 0.3 mm wide; soralia laminal and often wider than the lobes; lower cortex paraplectenchymatous
..... *Phaeophyscia insignis*
43. Lobes 0.5 mm or more wide; soralia marginal, apical, or, if laminal, narrower than the lobes; lower cortex prosoplectenchymatous *Physciella*
36. Upper cortex K+ yellow (atranorin or thamnolic acid present) 44
44. Lower surface white to pale tan or yellow-orange 45
45. Thallus isidiate, or lower surface fibrous and cottony, or both 46

Key B: Foliose lichens (continued)

- 46. Isidia thin, cylindrical; upper cortex K⁺ instantly deep yellow (thamnolic acid) *Imshaugia aleurites*
- 46. Sorediate, without diaspores, or if isidiate, isidia granular and subsorediate; upper cortex K⁺ pale yellow (atranorin) *Heterodermia*
- 45. Thallus not isidiate; lower surface corticate 47
- 47. Soredia marginal, farinose; thallus marginally ciliate *Heterodermia*
- 47. Soredia, if present, laminal or coarse and sublobulate; thallus eciliate *Physcia*
- 44. Lower surface black, sometime with a paler brown marginal zone 48
- 48. Lower surface tomentose; lobes appearing thickened and inflated *Anzia colpodes*
- 48. Lower surface rhizinate; lobes flattened 49
- 49. Thallus without diaspores 50
- 50. Medulla white throughout, K⁻; at least some rhizines with dichotomous branches; upper cortex \pm smooth *Hypotrachyna livida*
- 50. Medulla locally pale yellow, at least under apothecia, K⁺ yellow to sordid reddish (galbinic acid); rhizines simple or with furcate tips; upper cortex often slightly rugose *Myelochroa galbina*
- 49. Thallus isidiate or sorediate 51
- 51. Thallus isidiate 52
- 52. Lobe tips with abundant angular white markings and reticulations 53
- 53. Medulla K⁺ yellow turning red, KC⁻ (salazinic acid); lower cortex predominately black; rhizines with squarrose branches *Parmelia squarrosa*
- 53. Medulla K⁻, KC⁺ faint purplish (perlatolic acid); lower cortex predominately dark brown; rhizines simple to sparsely branched *Canoparmelia caroliniana*
- 52. Lobe tips without well-defined white markings 54
- 54. Medulla, at least in part, pale yellow, KC⁺ yellow (galbinic acid) *Myelochroa obsessa*
- 54. Medulla white throughout, KC⁺ reddish (gyrophoric acid or hiasic acid agg.) *Parmelinopsis*

Key B: Foliose lichens (continued)

51. Thallus sorediate, the soredia sometimes arising from coarse, isidia-like pustules 55
55. Medulla yellow; lobe tips pruinose *Pyxine*
55. Medulla white; lobes tips epruinose 56
56. Thallus closely appressed to and appearing almost confluent with sheltered siliceous rocks; rhizines lacking *Dirinaria frostii*
56. Thallus \pm adnate on, but not tightly appressed to, various substrates; rhizines abundant 57
57. Larger rhizines with frequent dichotomous branches; thallus with coarse, inflated, ~~hypopustules~~ *Hypopustulifera*
57. Larger rhizines simple to sparsely furcate; thallus without pustules 58
58. Soredia in diffuse laminal patches; medulla often pale yellow, at least locally; white portions of medulla K-, KC- *Myelochroa aurulenta*
58. Soredia in small, laminal soralia or occurring along thallus ridges; medulla uniformly white, K⁺ yellow (stictic acid) or KC⁺ briefly faint purple (divaricatic acid) *Canoparmelia*

KEY C: SQUAMULOSE LICHENS

1. Perithecia present; thallus brown or gray 2
 2. Ascospores muriform, becoming brownish; photobiont present in hymenium *Endocarpon pusillum*
 2. Ascospores simple or 1-septate, hyaline; hymenium lacking photobiont 3
 3. Squamules gray, < 1 mm wide; ascospores 1-septate *Placidiopsis minor*
 3. Squamules brown, > 3 mm wide; ascospores simple *Placidium*
1. Perithecia absent, thallus apotheciate or sterile, variously colored 4
 4. Thallus of small, convex, gray green squamules with pale, minute, spiculate cortical hairs, resembling miniature cactus pads *Agonimia opuntiella*
 4. Thallus variously shaped, glabrous 5
 5. Thallus sorediate, or lignicolous/corticolous, or both 6
 6. Thallus of delicate blue-gray, ± appressed squamules with upturned edges; soredia laminal and marginal *Normandina pulchella*
 6. Thallus greenish or bluish to brownish, of ± ascending squamules; soredia marginal 7
 7. Photobiont a cyanobacterium (cf. *Anacystis*) *Peltula*
 7. Photobiont chlorophycean (*Trebouxia* or chlorococcoid) 8
 8. Squamules to 1.5 mm wide, lustrous, brown above, slightly ascending to loosely appressed, ± entire *Hypocenomyce*
 8. Squamules often > 1.5 mm wide, not notably lustrous, predominately bluish to greenish gray above, strongly ascending, often incised or lobed *Cladonia*
 5. Thallus lacking diaspores; substrate various 9
 9. Squamules greenish or bluish gray, sometimes also tinged with brownish, ascending *Chadonia*
 9. Thallus (dry) brown or grayish, lacking bluish or greenish tones, usually ± appressed to substrate 10
 10. Photobiont a cyanobacterium 11
 11. On calciferous soils; apothecia immersed; photobiont cf. *Scytonema* *Heppia adglutinata*
 11. Saxicolous; apothecia sessile; photobiont *Nostoc* *Fuscopannaria leucosticta*
 10. Photobiont chlorophycean 12

Key C: Squamulose lichens (continued)

- 12. Squamules ca. 1 mm wide, brownish gray with dark thickened margins; on siliceous rocks or silty soil pockets over siliceous rocks *Psorula rufonigra*
- 12. Squamules mostly > 1 mm wide, brown to reddish brown, margins, if thickened, pale; on calciferous rocks or soil 13
- 13. Terricolous *Psora*
- 13. Saxicolous 14
- 14. Squamules pale beneath, with \pm thickened, whitish margins; apothecia reddish brown; hymenium IKI- *Psora*
- 14. Squamules dark beneath, with thin, brown to dark margins; apothecia black; hymenium IKI+ blue *Lecidea lurida*

KEY D: STERILE CRUSTOSE LICHENS

- 1. Thallus leprose, of undifferentiated powdery masses of fungal hyphae loosely enveloping algal cells, lacking any vestige of cortex or morphological organization (occasionally appearing indistinctly lobed along margin) 2
- 2. Thallus yellow or with distinct yellow tints (if greenish yellow, see # 2 below) 3
- 3. Thallus bright lemon yellow *Chrysothrix*
- 3. Thallus dull grayish or brownish yellow 4
- 4. Thallus K+ deep grape purple (unknown substance with R_f of 1/2/1); on siliceous rocks *Leproloma vouauxii*
- 4. Thallus K+ reddish magenta (parietin); on dry sheltered carbonate faces *Caloplaca chrysodeta*
- 2. Thallus greenish to bluish or gray 5
- 5. Usnic acid present *Lecanora*
- 5. Usnic acid absent *Lepraria*
- 1. Thallus not totally leprose, at least partially corticate and/or morphologically organized and differentiated 6
- 6. Thallus yellow to orange 7
- 7. Upper cortex K+ deep magenta (parietin) *Caloplaca*
- 7. Upper cortex K- or K+ weakly reddish (calycin) 8

Key D: Sterile crustose lichens (continued)

8. Thallus of discrete, corticate or sorediate granules *Candelariella*
8. Thallus of diffuse masses of soredia intermingled with occasional corticate fragments
..... *Candelaria concolor*
6. Thallus greenish or bluish to gray, without yellowish tints 9
9. Medulla C+ reddish and/or KC+ reddish (gyrophoric acid or erythrin) 10
10. Saxicolous; erythrin present, gyrophoric acid absent
..... *Dirina massiliensis* var. *sorediata*
10. Corticolous; erythrin absent, gyrophoric acid present 11
11. UV+ yellow (lichexanthone) *Ochrolechia arborea*
11. UV- 12
12. Thallus isidiate, brownish *Placynthiella icmalea*
12. Thallus sorediate, grayish green *Trapeliopsis flexuosa*
9. Medulla C-, KC- 13
13. Thallus K+ yellow or red (atranorin, norstictic, stictic, or thamnolic acids) 14
14. Thallus K+ yellow turning red (norstictic acid); saxicolous ... *Phlyctis argenta*
14. Thallus K+ yellow (stictic or thamnolic acids); corticolous or saxicolous ... 15
15. Thallus thin, pale gray, with soralia containing farinose to finely granular
soredia 16
16. Soralia punctiform; stictic acid present, atranorin lacking
..... *Nadvornikia sorediata*
16. Soralia larger, \pm round; stictic acid lacking, atranorin present
..... *Lecanora impudens*
15. Thallus thicker, bluish gray, with diffuse patches of hollow pustules which
sometimes disintegrate into a granular sorediate appearance
..... *Loxospora pustulata*
13. Thallus K- (psoromic acid or no lichen substances) 17
17. Muscicolous or humicolous; with minute, pale, shallowly lacerate
hyphophores *Gyalideopsis* sp. #2
17. Corticolous, saxicolous, or muscicolous; hyphophores lacking 18

Key D: Sterile crustose lichens (continued)

- 18. Thallus UV+ pinkish, KC+ orange (xanthones); muscicolous or rarely saxicolous *Pertusaria globularis*
- 18. Thallus UV-, KC-; substrate various 19
 - 19. Thallus with diffused, papillose to apically spiciform isidia
..... *Rinodina papillata*
 - 19. Thallus not idiosiate 20
 - 20. Thallus pale gray, \pm scurfy; psoromic acid present
..... *Phlyctidia ludoviciensis*
 - 20. Thallus greenish gray to dark gray; no lichen substances present .. 20
 - 21. Thallus of minute, rounded, strongly convex squamules
..... *Agonimia* sp. #1
 - 21. Thallus \pm continuous, of fimbriate-dissected, isidiate, plane to convex squamules *Phyllopsora corallina*

KEY E: CRUSTOSE LICHENS WITH STALKED APOTHECIA OR STIPITATE STRUCTURES

1. Stalked or stipitate structures hyphophores (producing conidiospores); ascospores, if present, hyaline, multiseptate to muriform, from sessile apothecia 2
 2. On canopy hardwood branches; hyphophores black, acicular *Gyalideopsis* sp. # 1
 2. On bryophytes, especially *Leucodon*, over trees and rocks; hyphophores pale, apically expanded and capped with a peltate, radially stellate apical plate *Gomphillus americanus*
1. Stalked structures terminating in apothecia; ascospores usually present, greenish to brown, simple to 1-septate 3
 3. Ascospores prevailingly 1-or more septate 4
 4. On *Alnus*; stipes often branched; at maturity some ascospores 2-3-septate *Stenocybe pullatula*
 4. Not on *Alnus*; stipes usually unbranched; ascospores consistently 1-septate 5
 5. On thalli of the polyporous fungus *Trichaptum biforme* *Phaeocalicium polyporaeum*
 5. Corticolous or lignicolous 6
 6. Asci disintegrating early and forming a mazaedium *Calicium*
 6. Spores maturing within mature asci, mazaedium lacking *Chaenothecopsis pusilla*
 3. Ascospores simple 7
 7. Asci disintegrating early and forming a mazaedium; spores maturing outside the asci ... 8
 8. On thalli of *Pertusaria*; stipes < 2 × longer than apothecia; mazaedium blackish *Sphinctrina tubiformis*
 8. Corticolous or lignicolous; stipes usually > 2 × longer than apothecia; mazaedium pale brownish *Chaenotheca*
 7. Asci persistent; spores maturing within asci 9
 9. Apex of ascus uniformly thickened *Mycocalicium*
 9. Apex of ascus unevenly thickened, eventually becoming penetrated by a canal *Chaenothecopsis*

KEY F: CRUSTOSE LICHENS WITH PERITHECIA OR PERITHECIA-LIKE ASCOMATA

1. Ascospores simple, hyaline 2
 2. Asci with > 100 spores *Thelopsis flaveola*
 2. Asci with 8 spores 3
 3. Terricolous; thallus filmy and indistinct or obsolete *Thrombium epigaeum*
 3. Corticolous or saxicolous; thallus obvious, usually not filmy 4
 4. Peritheciate; ascospores single-walled, < 30 µm long *Verrucaria*
 4. Apothecia immersed in corticate verrucae and opening via pore-like ostioles; ascospores double-walled, > 40 µm long *Pertusaria*
1. Ascospores 1-septate to muriform, hyaline or colored 5
 5. Ascospores muriform to submuriform, with at least 1 cell longitudinally divided 6
 6. Muscicolous *Chromatochlamys muscorum*
 6. Corticolous or saxicolous 7
 7. Thallus brown to grayish brown, rimose-areolate to minutely squamulose 8
 8. Spores 2/ascus; thallus of ± dispersed subsquamulose areoles *Endocarpon pusillum*
 8. Spores 8/ascus; thallus continuous, areolate to rimose *Staurothele diffractella*
 7. Thallus variously colored, ± continuous 9
 9. Saxicolous *Polyblastia* sp.
 9. Corticolous 10
 10. Ascospores brown, at least at maturity; photobiont always present 11
 11. Thallus dull, brownish gray, with dark rounded ascomata composed of several perithecia-like locules; ascospore walls not thickened, the lumina conformable with the outer spore wall *Mycoporum*
 11. Thallus sublustrous, brown tinged with olive greenish, with corticate verrucae containing embedded perithecia and apical brown ostioles; ascospore walls thickened, the lumina not conformable to the outer spore wall *Pyrenula ravenelii*
 10. Ascospores persistently hyaline; photobiont present or absent 12
 12. Photobiont *Trentepohlia* *Strigula submuriformis*
 12. Photobiont absent 13

13. Thallus smooth, pale silvery gray; ascomata walls blue green; on young, smooth bark in high light intensities *Mycoglaena meridionalis*
13. Thallus indistinct, whitish; ascomata walls brown to black; on shaded lower boles of hardwoods *Julella fallaciosa*
5. Ascospores with transverse septa only 14
14. Ascospores 1-septate 15
15. Ascospores greenish to darkened; photobiont absent [*Kirschsteinothelia*]
[This nonlichenized fungus is often confused with lichens. The thin, indistinct, undifferentiated grayish thallus has scattered, sessile, convex black perithecia with 2 celled, greenish to brownish, often slightly asymmetrical, ascospores, each less than 25 µm long.]
15. Ascospores hyaline; photobiont *Trentepohlia* 16
16. Ascospores at least 35 µm long *Acrocordia megalospora*
16. Ascospores to 25 µm long 17
17. Paraphyses abundantly branched and anastomosed; macroconidia simple *Anisomeridium*
17. Paraphyses unbranched to sparingly and remotely branched; macroconidia septate *Strigula americana*
14. Ascospores 2+ septate 18
18. Saxicolous 19
19. On carbonate rocks near streams; perithecia ± immersed, often pinkish *Thelidium incavatum*
19. On siliceous rocks in various habitats; perithecia superficial, dark to black .. 20
20. Ascospores 7+ celled, typically attenuate at one end *Trichothelium*
20. Ascospores to 4-celled, blunt at both ends *Anisomeridium distans*
18. Corticolous 21
21. Ascospore walls thickened, the lumina lenticular to subspherical 22
22. Ascospores hyaline 23
23. Ascospores 3-septate *Lithothelium illotum*
23. Ascospores prevailingly 7-9-septate *Trypethelium virens*
22. Ascospores brown 24
24. Ascospores 5-7-septate *Lithothelium macrosporum*
24. Ascospores 3-septate 25

Key F: Crustose lichens with perithecia (continued)

- 25. Perithecia with lateral ostioles, the ostiole typically forming a neck-like projection; ascospores dark brown (cola brown) *Lithothelium phaeosporum*
- 25. Perithecia with apical ostioles, the ostioles sessile to immersed and not projecting; ascospores greenish to lighter brown (tea brown)[post-mature ascospores sometimes darkening — these often appear shriveled and misshapen] *Pyrenula*
- 21. Ascospore walls not thickened, the lumina cylindrical 26
- 26. Photobiont absent; ascocarp walls blue green *Mycoglaena*
- 26. Photobiont present; ascocarp walls pale to dark, but not blue green 27
- 27. Ascospores linear, 20+ septate, > 80 µm long; photobiont *Trebouxia* *Conotrema urceolatum*
- 27. Ascospores fusiform to subacicular, to ca. 14 septate, <45 µm long; photobiont *Trentepohlia* 28
- 28. Ascospores 7+ septate, > 32 µm long, typically attenuate at one end *Trichothelium*
- 28. Ascospores 3-7 septate, < 32 µm long, not apically attenuate *Strigula*

KEY G: CRUSTOSE LICHENS WITH LIRELLIFORM, BRANCHED, OR STELLATE APOTHECIA

- 1. Ascospores muriform; apothecia obscurely elongate and aggregated into substellate arrays *Arthothelium taediosum*
- 1. Ascospores 1-several septate, but never longitudinally divided; apothecia lirelliform, branched, or stellate 2
- 2. Apothecia reddish or brown to black, never pruinose; asci globose to pyriform; exciple undeveloped *Arthonia*
- 2. Apothecia black, sometimes pruinose; asci elongate; exciple well developed 3
- 3. Ascospores 1 septate *Melaspilea arthonioides*
- 3. Ascospores 3+ septate 4
- 4. Ascospores with lenticular to oval lumina, IKI+ violet; paraphyses unbranched; hymenium IKI- *Graphis scripta*
- 4. Ascospores with cylindrical lumina, IKI-; paraphyses branched and anastomosing; hymenium IKI+ bluish to brownish *Opegrapha*

KEY H: CRUSTOSE LICHENS WITH ROUND APOTHECIA

1. Thallus yellow to orange or apothecia orange to brownish and K+ magenta (parietin) 2
 2. Thallus yellow, K- 3
 3. Saxicolous; of flattened, isodiametric, \pm contiguous areoles with immersed apothecia; ascospores $> 100/\text{ascus}$ *Acarospora*
 3. On various substrates; thallus of small granules or tiny \pm elongate squamules; apothecia superficial; ascospores 32 or less per ascus *Candelariella*
 2. Thallus color various, if yellow, then thallus K+ magenta (parietin) 4
 4. Spores polarilocular (immature spores sometimes simple); substrate and thallus color various *Caloplaca*
 4. Spores simple; on carbonate rocks; thallus thin, grayish *Protoblastenia rupestris*
1. Thallus not yellow or orange; apothecia K- 5
 5. Photobiont absent 6
 6. Ascocarp walls pale to brownish; ascospores 3-5 septate, but usually lacking *Arthonia punctiformis*
 6. Ascocarp walls blue green; ascospores 3-5 septate to submuriform, usually present *Mycoglaena*
 5. Photobiont present 7
 7. Ascospores submuriform to muriform, with at least one cell longitudinally divided 8
 8. Corticolous 9
 9. Thallus brownish; ascomata of several aggregated perithecia-like locules with separate ostioles, each aggregation resembling a flattened bunch of grapes *Mycoporum*
 9. Thallus pale gray; apothecia separate, rounded to substellate *Arthothelium*
 8. Saxicolous 10
 10. Spores 1/ascus; apothecia immersed and obscured by coarse pruina *Phlyctis argena*
 10. Spores 8/ascus; apothecia not obscured by coarse pruina 11
 11. Apothecia pale to pinkish, immersed; photobiont *Trentepohlia* *Gyalecta*
 11. Apothecia dark, immersed to superficial; photobiont *Trebouxia* 12

12. Apothecia superficial; paraphyses branched and anastomosing; thallus brownish to dark gray *Rhizocarpon*
12. Apothecia immersed and sunken; paraphyses simple to sparsely furcate; thallus pale gray *Diploschistes*
7. Ascospores simple to transversely septate 13
 13. Ascospores greenish to brown 14
 14. Thallus placodioid, distinctly lobate at the margins, yellowish green (usnic acid); on siliceous rocks *Dimelaena oreina*
 14. Thallus crustose to areolate, not marginally lobed, not yellowish green (usnic acid absent); substrate various 15
 15. Well developed thalline margin present; ascospores with thickened walls, the lumina angular or subspherical *Rinodina*
 15. Thalline margin inconspicuous or absent at maturity; ascospores with thin, uniform walls, the lumina conformable to the outer cell wall 16
 16. Photobiont *Trentepohlia*; ascospores pale brown; hymenium and asci IKI- *Melaspilea arthonioides*
 16. Photobiont *Trebouxia*; ascospores green to dark brown; hymenium and asci IKI+ blue 17
 17. Thallus K+ yellow or red (stictic or norstictic acid) or C+ orange (xanthones), or else thallus a well-developed, ± thick, areolate saxicolous crust; microconidia elliptical to bacilliform *Buellia*
 17. Thallus K-, C- (no lichen substances), thin and ± continuous to obsolete; substrate various; microconidia acicular to filiform *Amandinea*
13. Ascospores hyaline 18
 18. Asci each with more than 20 spores 19
 19. Corticolous; apothecia superficial, with well developed thalline margin *Maronea polyphaea*
 19. Saxicolous; apothecia immersed, or if superficial, lacking a thalline margin 20
 20. Thallus areolate; apothecia immersed, variously colored *Acarospora*
 20. Thallus inconspicuous; apothecia superficial, dark 21

- 21. Apothecia with irregularly ridged and lumpy disks; paraphyses branched and anastomosing *Polysporina*
- 21. Apothecia with smooth disks; paraphyses unbranched . . . *Sarcogyne*
- 18. Asci each with 8 or fewer spores 22
- 22. Ascospores 1+ septate 23
- 23. Photobiont a cyanobacterium; thallus black, isidiate, typically bordered by a conspicuous blue black prothallus *Placynthium nigrum*
- 23. Photobiont chlorophycean; thallus not black, isidia absent; prothallus, if present, not blue black 24
- 24. Ascospores 1/ascus; corticolous *Phlyctidia ludoviciensis*
- 24. Ascospores 8/ascus; substrate various 25
- 25. Ascospores 2+ septate 26
- 26. Muscicolous or humicolous 27
- 27. Ascospores < 50 µm long; hyphophores absent
. *Myxobilimbia*
- 27. Ascospores > 100 µm long; pale, stipitate hyphophores present *Gomphillus americanus*
- 26. Corticolous, lignicolous, or saxicolous 28
- 28. Ascospores elongate, linear to acicular, 4+ septate 29
- 29. Thallus corticolous *Bacidia*
- 29. Thallus saxicolous 30
- 30. Apothecia immersed in the substrate; photobiont *Trentepohlia* *Petractis farlowii*
- 30. Apothecia superficial; photobiont *Trebouxia* or chlorococcoid 31
- 31. Corticolous *Bacidina delicata*
- 31. Saxicolous 32
- 32. Hypothecium pale; spores twisted in the ascus *Scoliciosporum umbrinum*
- 32. Hypothecium reddish brown; spores straight in the ascus *Bacidina egenula*
- 28. Ascospores elliptical to fusiform, 3 septate 33

- 33. Saxicolous 34
 - 34. Usually on carbonate rocks; hypothecium and exciple brown *Bacidia granosa*
 - 34. On siliceous rocks; hypothecium pale or, if brown, exciple greenish 35
 - 35. Thallus areolate, pale grayish *Micarea peliocarpa*
 - 35. Thallus \pm continuous, dark greenish gray *Fellhanera silicis*
- 33. Corticolous or lignicolous 36
 - 36. Lignicolous 37
 - 37. Epithecium pale; paraphyses mostly simple or with sparse apical branching *Absconditella lignicola*
 - 37. Epithecium greenish; paraphyses branched *Micarea*
 - 36. Corticolous 38
 - 38. Apothecia covered with whitish pruina; thallus brown *Schismatomma glaucescens*
 - 38. Apothecia dark, or if bluish pruinose, then thallus yellowish green *Arthonia*
- 25. Ascospores 1-septate 39
 - 39. Ascospores strongly polarilocular, with thickened septum *Caloplaca*
 - 39. Ascospores not polarilocular, septum not thickened 40
 - 40. Saxicolous 41
 - 41. Apothecia with well developed thalline margin 42
 - 42. Thallus crustose, without a well developed prothallus; perispore not evident on ascospores *Lecania*
 - 42. Thallus subsquamulose, with a well developed black prothallus; thick gelatinous perispore evident on ascospores *Halecania* sp. #1
 - 41. Mature apothecia without a thalline margin 43

- 43. On carbonate rocks *Catillaria lenticularis*
- 43. On siliceous rocks 44
 - 44. Hypothecium pale; hymenium IKI-; ascospores to $16 \times 4 \mu\text{m}$ *Fuscidea recensa*
 - 44. Hypothecium brown; hymenium IKI+ blue; ascospores $> 14 \times 6 \mu\text{m}$ *Rhizocarpon*
- 40. Corticolous, lignicolous, muscicolous, or humicolous 45
 - 45. At least some apothecia irregular, substellate, or short-lirelliform 46
 - 46. Paraphyses absent or sparse and indistinct; asci globose to pyriform; apothecia immersed *Arthonia*
 - 46. Paraphyses well developed; asci rounded; apothecia sessile to partially immersed ... *Melaspilea arthonioides*
 - 45. Apothecia \pm circular 47
 - 47. Photobiont *Trentepohlia*; apothecia pale yellowish to pinkish or orange *Dimerella*
 - 47. Photobiont *Trebouxia* or chlorococcoid; apothecia mostly dark; if pale, without yellow or orange tints 48
 - 48. Paraphyses strongly dark brown capitate *Catillaria nigroclavata*
 - 48. Paraphyses not dark brown capitate (a brownish pigment sometimes surrounds the upper cells of the paraphyses) 49
 - 49. Paraphyses richly branched; hymenium IKI+ blue *Micarea*
 - 49. Paraphyses simple or sparingly branched; hymenium IKI- *Fuscidea* sp. #1
- [margins shifted to left]
- 22. Ascospores simple 50
 - 50. Apothecia not immersed, with a well developed thalline margin 51
 - 51. Ascospore large, rotund, $> 30 \mu\text{m}$ long *Ochrolechia*
 - 51. Ascospores various, $< 20 \mu\text{m}$ long 52

- 52. Hymenium purplish red; apothecia black; on siliceous rocks *Tephromela atra*
- 52. Hymenium hyaline below the epithecium; substrate various, but if on siliceous rock, then apothecia not black *Lecanora*
- 50. Apothecia immersed, or if superficial, then lacking a thalline margin 53
- 53. Ascospores large, > 40 μm long, single or double walled; apothecia either immersed in corticate verrucae with perithecia-like ostioles, or forming sorediate or pruinose verrucae *Pertusaria*
- 53. Ascospores smaller, to 30 μm long, single walled; apothecia disks exposed 54
- 54. Apothecia immersed in a well developed thallus; if saxicolous, on siliceous rocks and not forming pits in the substrate 55
- 55. Apothecial disks pale, pinkish to tan; thallus thin, with poorly or un-differentiated cortex *Ionaspis*
- 55. Apothecial disks dark gray to black; thallus with well defined cortex *Aspicilia*
- 54. Apothecia sessile and superficial, or forming pits in carbonate rocks 56
- 56. Saxicolous 57
- 57. On carbonate rocks 58
- 58. Apothecia with diffuse white pruina; epithecium gray green to dark green; lower portion of hymenium purplish *Pachyphysis ozarkana*
- 58. Apothecia epruinose; epithecium reddish brown; lower portion of hymenium pale *Clauzadea metzleri*
- 57. On siliceous rocks 59
- 59. Thallus C+, KC+ reddish (gyrophoric acid) *Trapelia involuta*
- 59. Thallus C-, KC- 60
- 60. Ascospores thick walled, > 15 μm long and 6 μm wide *Porpidia*
- 60. Ascospores thin walled, < 15 μm long and 6 μm wide 61
- 61. Epithecium and exciple grayish or brown 62
- 62. Apothecia black to gray *Lecidea cyrtidia*
- 62. Apothecia pale to orange brown *Micarea lithinella*
- 61. Epithecium and exciple green to blue green 63

- 63. Thallus light gray, apothecia often > 0.5 mm wide *Lecidella*
- 63. Thallus dark gray or greenish gray; apothecia to 0.5 mm wide *Micarea erratica*
- 56. Corticolous or lignicolous 64
 - 64. Apothecia bright red *Pyrrhospora russula*
 - 64. Apothecia pale to brownish or black 65
 - 65. Thallus C+, KC+ reddish (gyrophoric acid present, xanthonenes absent) ... 66
 - 66. Thallus sorediate, greenish gray *Trapeliopsis*
 - 66. Thallus isidiate, dark brown to black *Placynthiella icmalea*
 - 65. Thallus C-, KC- or C+ orange (gyrophoric acid absent, xanthonenes sometimes present) 67
 - 67. Thallus with fimbriate-dissected to isidiate squamules *Phyllopsora corallina*
 - 67. Thallus areolate to continuous, not lobulate or isidiate 68
 - 68. Epithecium and/or exciple bluish green *Lecidella*
 - 68. Epithecium and exciple variously colored, not bluish green ... 69
 - 69. Corticolous; UV+ pinkish, C+ orange (xanthonenes) *Lecidea varians*
 - 69. Lignicolous; UV-, C- (xanthonenes absent) 70
 - 70. Thallus dark gray, apothecia black, to 0.3 mm wide; paraphyses scanty *Micarea misella*
 - 70. Thallus pale gray to greenish gray; apothecia tan to brown, some > 0.4 mm wide; paraphyses abundant *Lecidea plebeja*

ABSCONDITELLA Vězda (Stictidaceae)

Inconspicuous crustose lichens of moist rotting wood, with indistinct, shiny, filmy thalli appearing slightly gelatinous when moist, apothecia pale, concave, minute, photobiont chlorococcoid, asci somewhat evocative of *Bacidia*-type asci, but I-, with 8 hyaline, bacilli form, 4-celled spores; 1 species in the region.

Absconditella lignicola Vězda & Pisút

[ABSLI] - crustose

Apparently very rare, but minute, cryptic, and easily overlooked. Known only from a wet, well-rotted log in heavy shade along the border of a fen in Shannon County. The tiny pale apothecia, typically less than 0.2 mm broad, are difficult to see on moist wood.

ACAROSPORA A. Massal. (Acarosporaceae)

Saxicolous crustose lichens with well developed, often subsquamulose, areolate thalli and immersed apothecia, photobiont chlorococcoid, asci clavate, with a distinct I- apical dome, with >100 small, hyaline, rounded to short-bacilli form spores; at least 3 species in the region.

1. Thallus bright yellow *A. contigua*

1. Thallus dark brown

2. Thallus C+ red (gyrophoric acid), usually >1.5 mm broad, mostly flat *A. fuscata*

2. Thallus C-, <1.5 mm broad, with a distinct swollen ring around the apothecia, giving the thalli a "bagel-like" appearance *A. sp. #1*

Acarospora contigua H. Magn.

[ACACO] - crustose

Occasional on exposed, siliceous rocks, often on igneous, chert or sandstone exposures in glades and on bluffs. Some specimens are white pruinose, and material from the Ozarks includes chemotypes with and without gyrophoric acid, but chemistry and pruina are not correlated. A related taxon on circumneutral to calcareous rocks in glades elsewhere in the Ozarks, *A. heufleriana* Körb., has greenish yellow thalli that contain norstictic acid and are covered with dense white pruina. [± gyrophoric acid]

Acarospora fuscata (Schrad.) Arnold

[ACAFU] - crustose

Frequent, although seldom dominant, on siliceous rocks in exposed to lightly shaded situations. This species often occurs as small, scattered groups of squamules, and is easily overlooked, especially on brownish sandstone outcrops in wooded uplands. The thallus contains gyrophoric acid, although in some specimens a C test does not show this and chromatography is necessary. A similar species lacking gyrophoric acid, *A. americana* H. Magn., occurs on massive sandstone exposures in the western Ozarks. [gyrophoric acid]

Acarospora sp. #1

[ACASP1] - crustose

Occasional on small fragments and pebbles of siliceous rocks, usually in exposed places such as bedrock expanses in igneous glades.

ACROCordia A. Massal. (Monoblastiaceae)

Small crustose lichens with inconspicuous, grayish, ± immersed thalli and dark, partially emergent perithecia, photobiont *Trentepohlia*, asci narrow, with a broad apical dome capped by a lens-like structure, I-, with 8 large, ovoid, hyaline, 1-septate spores, but often several spores not developing fully; 1 species in the region. Reference: Harris (1973, 1995).

Acrocordia megalospora (Fink) R. C. Harris

[ACRME] - crustose

Known from a few locations on the shaded lower boles and bases of trees in mature woodlands.

AGONIMIA Zahlbr. (Verrucariaceae)

Crustose lichens with rounded, greenish, minutely tomentose, granular squamules and small, sessile, black perithecia, photobiont chlorococcoid, asci thin-walled, without an ocular chamber, with 8 hyaline, muriform spores [local populations are always sterile]; 2 species in the region.

Squamules with pale spiculate hairs, resembling miniature prickly pear cactus pads *A. opuntiella*

Squamules glabrous *A. sp. # 1*

Agonimia opuntiella (Buschardt & Poelt) Vězda [AGOOP] - crustose
Common, but often overlooked, usually growing on or among shaded pleurocarpous bryophytes on rocks and shaded tree bases.

Agonimia sp. # 1 [AGOSP1] - crustose
Occasional, but seldom collected, and often sterile; on lightly shaded bryophytes and stable humus in wooded uplands, in habitats similar to those for *Dimerella pineti* and *Myxobolimia sabuletorum*.

AMANDINEA M. Choisy ex Scheid. & H. Mayrhofer (Physciaceae)

Small crustose lichens with dark to not apparent thalli, photobiont *Trebouxia*, asci *Biatora* type, with 8-32 brown, 1-septate spores, the spore walls not notably thickened; 3 species in the region. Reference: Sheard & May (1997).

1. Asci 12-32 spored; thallus dark gray, thin and continuous *A. polyspora*

1. Asci 8 spored; thallus pale gray or greenish, thick and areolate-continuous or not apparent.

2. Apothecia with thalline margins; thallus dark greenish and areolate to continuous *A. dakotensis*

2. Apothecia lacking thalline margins; thallus thin and grayish or not apparent *A. punctata*

Amandinea dakotensis (H. Magn.) P. May & Sheard [AMADA] - crustose
Uncommon on small, exposed, smooth-barked hardwood twigs in canopy branches, and occasionally on young branches of smaller trees in fields and along woodland edges. Common substrates are *Acer saccharinum* and *Cercis canadensis*.

Amandinea polyspora (Willey) E. Lay & P. May [AMAPO] - crustose
Frequent on small branches in exposed to lightly shaded habitats, including both upper twigs of canopy trees and twigs and small branches of young trees in old fields and along woodland edges. This species is part of a "pioneer cohort" of lichens that are among the first to colonize young corticolous substrates. Associated taxa with the same autecology include *Arthonia caesia*, *Lecanora strobilina* and *Lecidea varians*.

Amandinea punctata (Hoffm.) Coppins & Scheid. [AMAPU] - crustose
Occasional in areas of high light exposure, including young twigs, old boards, exposed fence posts, and exposed siliceous rocks. It regularly occurs on *Pinus echinata*, both on the bole, where it prefers the edges of large bark flakes, and on the scales of two year or older cones, where it is consistently associated with *Lecanora strobilina*. Local material displays a wide variability and may encompass multiple taxa, with thallus development ranging from no visible thallus to a thin gray thallus. Saxicolous forms usually lack an apparent thallus, and material on *Pinus* usually has a thin, silvery-gray thallus.

ANAPTYCHIA Körb. (Physciaceae)

Narrow-lobed, brownish foliose lichens, often lobulate, upper cortex K- and lower surface pale and rhizinate, apothecia sessile, with well-developed, often lobulate or crenulate thalline margin, photobiont *Trebouxia*, asci *Lecanora*-type, with 8 brown, 1-septate spores; 1 species in the region.

Anaptychia palmulata (Michx.) Vainio

[ANAPA] - foliose

Infrequent on shaded, usually mossy rocks and tree bases in mature woodlands, in both mesic and dry mesic habitats. This species occurs sporadically, with a single rock or tree base having several thalli, and no other individuals occurring in the vicinity. The thallus is brown when dry but turns a distinctive bright green when wet. [zeorin, \pm atranorin]

ANISOMERIDIUM (Müll. Arg.) M. Choisy (Monoblastiaceae)

Small crustose lichens, with pale to not apparent thalli, dark superficial perithecia, photobiont *Trentepohlia*, asci narrow, with a squat apical dome, I-, with 8 hyaline, ovoid, 1-septate spores; 2 species in the region. References: Harris (1973, 1995).

Thallus not apparent; saxicolous *A. distans*

Thallus thin, whitish to pale gray; corticolous *A. polypori*

Anisomeridium distans (Willey) R. C. Harris

[ANIDI] - crustose

Uncommon on lightly shaded sandstone boulders and fragments in wooded uplands, typically on ridges in sterile xeric woodlands. The ascospores are tardily 4-celled.

Anisomeridium polypori (Ellis & Everh.) M.E. Barr

[ANIPO] - crustose

Occasional on bases and shaded lower boles of hardwoods in woodlands. Local populations of this species are often sterile, but can be identified by the abundant *Trentepohlia* in the thin, whitish to pale tan thallus, bacilliform microconidiospores, and shaded habitat. This species is sometimes called *A. nyssaegenum* (Ellis & Everh.) R.C. Harris. A similar species not yet found in the Lower Ozarks, *A. biforme* (Borrer) R. C. Harris, has ascospores about twice as long as broad and globose microconidiospores, whereas the ascospores of *A. polypori* are about three times as long as broad. *Anisomeridium* can be distinguished from *Julella fallaciosa*, even when sterile, by the lack of a photobiont in the latter species. I am unable to distinguish sterile thalli of *A. polypori* from those of *Strigula submuriformis*.

ANZIA Stizenb. (Parmeliaceae)

Foliose lichens with thickened, narrow lobes, a thick layer of black tomentum on the lower surface, sessile apothecia exceeding the lobe width, with a well-developed thalline margin, photobiont *Trebouxia*, asci with numerous minute hyaline spores; 1 species in the region.

Anzia colpodes (Ach.) Stizenb.

[ANZCO] - foliose

Rare on lower and mid boles of *Quercus* in mature woodlands. In the Ozark region, this appears to be one of a cohort of lichens requiring older growth woodlands. Due to prevailing land use over the last century, these lichens are increasingly scarce. Other lichens with similar habitat restrictions and consequent rarity include *Pannaria subfusca*, *Pseudocyphellaria aurata*, *Usnea ceratina*, and *Usnea trichodea*. While many early records of *A. colpodes* from the Midwest are fertile, local material is now almost invariably sterile. Skorepa (1973) noted this same phenomenon with *Coccocarpia palmicola* populations in southern Illinois. [atranorin, divaricatic acid]

ARTHONIA Ach. (Arthoniaceae)

Small crustose lichens, thallus thin or not apparent, with small, immersed to sessile, often irregular or stellate apothecia, photobiont *Trentepohlia*, chlorococcoid, or absent, asci pyriform to globose,

with evident apical dome, with 8 hyaline 1-5-septate spores; 5 species in the region. Species concepts for Ozark material are tentative and the following account is extremely provisional.

1. Thallus greenish and granular, containing usnic acid; apothecia round, sessile, and frosted with a patina of blue-gray crystals; photobiont chlorococcoid *A. caesia*

1. Thallus whitish, gray, or silvery, thin and smooth or lacking, without usnic acid; apothecia irregular, immersed, without a surface patina; photobiont *Trentepohlia* or absent.

2. Photobiont absent; thallus thin, silvery gray, on young twigs; apothecia immersed, black, irregularly rounded; spores usually absent *A. punctiformis*

2. Photobiont present; thallus whitish to gray or brownish, usually not on young twigs; apothecia immersed to superficial, irregularly elongate and branched; spores often present.

3. Spores 2-celled; apothecia black, small, not much branched and elongate *A. dispersa*

3. Spores with 3-5 cells; apothecia various.

4. Apothecia black; upper hymenium black *A. radiata*

4. Apothecia reddish to brown; upper hymenium pale *A. rubella*

***Arthonia caesia* (Flot.) Körb.**

[ARTCA] - crustose

Common on young twigs and branches in high light intensities, as well as on boles of young trees in old fields and along glade and woodland margins. Occasionally this species occurs in low numbers on lightly shaded hardwood boles in uplands. In extensive wooded uplands, this is one of a cohort of pioneer species inhabiting young canopy twigs, along with *Amandinea polyspora* and *Lecanora strobilina*. This species has a chlorococcoid photobiont [usnic acid]

***Arthonia dispersa* (Schr.) Nyl.**

[ARTDI] - crustose

Uncommon on hardwood bark in woodlands, usually in mesic areas along streams. Substrates include *Carya cordiformis* and *Diospyros virginiana*. The photobiont is *Trentepohlia*.

***Arthonia punctiformis* Ach.**

[ARTPU] - crustose

Frequent, but seldom well-developed, and thus seldom collected; on smooth young twigs and branches in high light exposures. The habitat and smooth, thin, silvery gray thallus with small, immersed, irregularly rounded black apothecia, and no photobiont is distinctive. Spores are usually absent, but if present, are typically 3 septate and <25 µm long. The only species with which this is likely to be confused are *Mycoglaena meridionalis* and *M. quercicola*, both of which have blue-green ascocarp walls, while *A. punctiformis* lacks walls.

***Arthonia radiata* (Pers.) Ach.**

[ARTRA] - crustose

Occasional on lightly shaded hardwood boles, typically in mesic woodlands and along streams. The apothecia of this species are usually reddish brown, and appear as a moniliform, stellately branched pattern on the thallus; the spores are typically 4-celled, with one terminal cell notably enlarged. The photobiont is *Trentepohlia*.

***Arthonia rubella* (Fée) Nyl.**

[ARTRU] - crustose

Apparently rare; on lightly shaded tree trunks in woodlands along streams and in mesic ravines. The photobiont is *Trentepohlia*.

ARTHOTHELIUM A. Massal. (Arthoniaceae)

Corticolous crustose lichens with thin, smooth, whitish gray thalli and small, immersed, irregular apothecia, photobiont *Trentepohlia* or chlorococcoid, asci *Arthonia*-type, with 8 hyaline to pale brownish, muriform spores; 2 species in the region.

1. Apothecia branched and elongate, typically <0.3 mm wide on their narrow axis; photobiont chlorococcoid

1. Apothecia larger and irregularly rounded, many typically >1 mm diameter; photobiont *Trentepohlia*

..... *A. spectabile*

Arthothelium spectabile A. Massal. [ARTSP] - crustose
Uncommon on lower and mid boles of trees in mesic, lightly shaded areas. This species can be recognized by the well-developed, continuous, whitish gray thallus with abundant, irregularly rounded, black apothecia typically to 0.5×1.5 mm.

Arthothelium taediosum (Nyl.) Müll. Arg. [ARTTA] - crustose
Frequent on a variety of smooth-barked trees in woodlands, especially on *Quercus coccinea*, *Q. rubra*, and *Q. velutina*. This species occurs from mid boles upward into the canopy, but is almost nonexistent at the bases of trees. The apothecia are notably smaller and more stellate-branched than in *A. spectabile*, with individual clusters usually < 0.5 mm broad.

ASPICILIA A. Massal. (Hymeneliaceae)

Saxicolous crustose lichens with gray to grayish green, continuous to areolate thalli and usually immersed apothecia, paraphyses moniliform, photobiont *Trebouxia*, asci with a slightly thickened tip, IKI-, with (4-6) 8 large, simple, hyaline, ovoid spores; 5 species in the region.

1. Thallus composed of discrete, thickened, gray areoles; apothecia immersed and sunken below level of upper cortex, pruinose, with densely pruinose thalline rim; on carbonate rocks *A. contorta*

1. Thallus continuous to rimose; apothecia immersed but not sunken, without pruina; on siliceous rocks.

2. Thallus K+ red (norstictic acid) *A. cinerea*

2. Thallus K- or K+ yellow (norstictic acid lacking or present as a trace substance).

3. Thallus light to medium gray, K- *A. caesiocinerea*

3. Thallus pale to dark greenish gray, K+ yellow (stictic acid).

4. Thallus thin, smooth, continuous to rimose; usually near permanent water ... *A. laevata*

4. Thallus thick, rimose to subareolate; uplands *A. verrucigera*

Aspicilia caesiocinerea (Nyl. ex Malbr.) Arnold [ASPCAE] - crustose
Occasional on shaded siliceous boulders and rock fragments in wooded uplands, occurring on chert, granite, rhyolite, and sandstone. Interestingly, this species does not occur on massive ledges, but on smaller boulders and fragments.

Aspicilia cinerea (L.) Körb. [ASPCI] - crustose
Occasional, with habitats and substrates similar to those of *A. caesiocinerea*. This species also occurs on siliceous rocks in more moist situations along streams and seeps. [norstictic acid]

Aspicilia contorta (Hoffm.) Kremp. [ASPCO] - crustose
Occasional on exposed dolomite boulders and ledges in glades and on bluffs, usually in full sun to light partial shade. The apothecia are typically white pruinose, and overlapped around their margins by a zone of upper cortex that is heavily pruinose and appears almost sorediate.

Aspicilia laevata (Ach.) Arnold [ASPLA] - crustose
Apparently local, on hard, exposed siliceous rocks near permanent water, such as on massive igneous exposures of shut-ins along Ozark streams. The thallus of this species is greenish tinged, as contrasted with the light gray thalli of *A. caesiocinerea* and *A. cinerea*. [stictic acid, \pm traces of norstictic acid]

Aspicilia verrucigera Hue [ASPVE] - crustose
Rare on siliceous rocks in xeric wooded uplands. This species is similar in color and chemistry to *A. laevata*, but has a thicker, areolate thallus and typically occurs in uplands, as opposed to the typical streamside habitat of *A. laevata*. [stictic acid, \pm traces of norstictic acid]

BACIDIA De Not. (Lecanoraceae)

Crustose lichens with sessile apothecia lacking a thalline margin, photobiont chlorococcoid, asci *Bacidia*-type, with 8 hyaline, fusiform to acicular, multi-septate spores; 7 species in the region. For clarity, some similar species formerly placed within the genus are included in the key. Reference: Ekman (1996).

1. Thallus corticobus.
 2. Apothecia to 0.3 mm diameter; ascospores, $>4\ \mu\text{m}$ wide and $<10\times$ longer than wide [Scoliciosporum chlorococcum]
 2. Many apothecia $>0.4\ \text{mm}$ diameter; ascospores $<4\ \mu\text{m}$ wide and $>10\times$ longer than wide.
 3. Apothecia black (rarely dark brown); epithecium greenish.
 4. Hypothecium pale or with a narrow brownish zone; spores $<40\ \mu\text{m}$ long; apothecia typically with sordid yellowish zones *B. circumspecta*
 4. Hypothecium deep reddish brown throughout; spores $>45\ \mu\text{m}$ long; apothecia uniformly black *B. schweinitzii*
 3. Apothecia brown to pale; epithecium brown to yellow or pale; hypothecium brown to colorless.
 5. Hypothecium golden to brownish, exciple and hypothecium K^+ rose in section.
 6. Thallus smooth, wrinkled, or areolate *B. polychroa*
 6. Thallus finely granular *B. diffracta*
 5. Hypothecium pale yellowish to colorless, K^- in section.
 7. Some apothecia pruinose, at least on margins; thallus somewhat thick ... *B. suffusa*
 7. Apothecia not pruinose, thallus thin *B. helicospora*
 1. Thallus saxicolous or on mosses over rocks or soil.
 8. Ascospores twisted and intertwined in tight, spirally-arranged mass in ascus, the free spores remaining \pm abruptly curved and twisted; hypothecium pale *Scoliciosporum umbrinum*
 8. Ascospores straight in ascus, not intertwined, the free ascospores remaining straight to very slightly and evenly arcuate; hypothecium reddish brown (pale in *Bacidina delicata*).
 9. Ascospores acicular; epithecium pale to greenish-blue *Bacidina*
 9. Ascospores fusiform; epithecium pale to yellowish, light gray, greenish.
 10. Exciple pale; spores $>4\ \mu\text{m}$ wide and mostly $>18\ \mu\text{m}$ long; muscicobus or humicobus . . . *Myxobilimbia sabuletorum*
 10. Exciple brown; spores $<4\ \mu\text{m}$ wide and $<18\ \mu\text{m}$ long; saxicolous *B. granosa*

Bacidia circumspecta (Norrl. & Nyl. ex Vain.) Malme [BACCI] - crustose
Occasional on shaded hardwood boles, usually associated with other species of *Bacidia*, such as *B. suffusa*. The small black apothecia are easily overlooked, and this species is often discovered as an incidental addition on other collections.

Bacidia diffracta Ekman [BACDI] - crustose
Occasional on shaded boles of *Juniperus virginiana* in established stands. This species is also infrequent on shaded hardwood boles, usually in mesic woodlands, ravines, and along streams. See comments under *B. polychroa*.

Bacidia granosa (Tuck.) Zahlbr. [BACGR] - crustose
Occasional on shaded, usually moist, carbonate substrates, typically on shaded dolomite outcrops in mesic ravines and along streams. This species also grows on old, shaded concrete in mesic microhabitats.

Bacidia helicospora S. Ekman [BACHE] - crustose

Apparently uncommon, on shaded hardwoods in dry to mesic sites. See comments under *B. schweinitzii*.

Bacidia polychroa (Th. Fr.) Körb. [BACPO] - crustose
Occasional on lower and mid boles of a variety of deciduous trees, especially in mesic areas. This species is very similar to *B. diffracta* except for the continuous, sometimes verruculose thallus, as opposed to the granular thallus of *B. diffracta*.

Bacidia schweinitzii (Fr. ex E. Michener) A. Schneid. [BACSC] - crustose
Common and locally abundant on middle portions of tree boles in moist to dry mesic woodlands. This is the most common member of the genus in the Lower Ozark region, and can be recognized in the field by the thick, granular, dark green thallus and black apothecia, sometimes with a dull brown marginal zone. Forms with brown or pale apothecia occur rarely in the area; these would key to *B. helicospora*, but differ in the larger apothecia and better developed thallus.

Bacidia suffusa (Fr.) A. Schneid. [BACSU] - crustose
Common on shaded hardwood and *Juniperus* boles, often in mesic situations but occasionally in drier sites. This species, *B. diffusa*, *B. polychroa* and *B. schweinitzii* can have pruinose apothecia, but *B. suffusa* typically has a thicker thallus with more purplish brown tones in the apothecia.

BACIDINA Vězda (Lecanoraceae)

Crustose lichens with thin grayish thalli and sessile, black, convex apothecia, thalline margin absent, photobiont chlorococcoid(?), occurring in discrete aggregations (goniocysts) within the thallus, asci *Bacidia*-type, with 8 hyaline, acicular, 3-7-septate spores; 2 species in the region.

1. Apothecia grayish to black; hypothecium reddish *B. egenula*

1. Apothecia pale to orangish or brown; hypothecium hyaline *B. delicata*

Bacidina delicata (Larbal. ex Leight.) Coppins [BACDE] - crustose
Known only from a single collection from shaded sandstone in a Shannon County woodland.

Bacidina egenula (Nyl.) Vězda [BACEG] - crustose
Apparently uncommon in the Lower Ozarks, although common elsewhere in the Midwest, occurring on calcareous substrates, especially in disturbed sites. Substrates include limestone, dolomite, concrete, mortar, and bricks. This species is most common around towns, cities, and habitations. The distinctive blue-green epithecium, acicular spores, and thin thallus are diagnostic.

BUELLIA De Not (Physciaceae)

Crustose lichens with well developed, continuous to areolate thalli and sessile black apothecia, thalline margin usually absent at maturity, photobiont *Trebouxia*, asci *Lecanora*-type, with 8 brown, ellipsoid to bacilliform, 1-3 septate spores; 6 species in the region. Reference: Imshaug (1951). The following key includes several other lichens with two-celled brown ascospores that could be confused with *Buellia*.

1. Apothecia lacking a thalline margin, the rim concolorous with the disk.

2. Thallus light gray, K+ yellow or red (stictic or norstictic acids).

3. Thallus corticobus.

4. Spores <15 µm long, to 6 µm wide, with bluntly rounded apices *B. stillingiana*

4. Spores >15 µm long, >7 µm wide, with +/- acute apices *B. curtisii*

3. Thallus saxicolous.

- 5. Thallus of thick areoles; norstictic and/or stictic acid present *B. spuria* s.l.
- 5. Thallus thin, rimose but not areolate; norstictic and high concentration of connorstictic acid present *B. "stigmaea"*
- 2. Thallus brown or dark green, rarely grayish or lacking; K-.
- 6. Thallus corticolous *Amandinea*
- 6. Thallus saxicolous.
- 7. Thallus not evident, or traces of thin gray thallus present *Amandinea punctata*
- 7. Thallus well-developed, gray, brown, or greenish.
- 8. Thallus grayish green to dark green, with confluent, rounded, granules and no evident prothallus; spores bacilliform, 3-septate *B. vernicoma*
- 8. Thallus brown, with lustrous, shiny, angular areoles and a well-developed black prothallus; spores ellipsoid, 1-septate *B. novomexicana*
- 1. Apothecia with a well developed thalline margin.
- 9. Spores thin-walled, the locules not angular *Amandinea dakotensis*
- 9. Spore walls thickened, the locules angular or rounded, well separated from the outer wall . *Rinodina*

Buellia curtisii (Tuck.) Imshaug [BUECU] - crustose
Occasional on exposed to lightly shaded hardwoods, often growing on upper branches of canopy trees. In the field this species appears identical to *B. stillingiana*. [norstictic acid]

Buellia novomexicana de Lesd. [BUENO] - crustose
Infrequent on exposed, relatively small, sandstone and chert fragments in dolomite glades. This species is easily recognized by the chocolate brown thallus with a well-developed black prothallus, and the restricted habitat.

Buellia spuria (Schaer.) Anzi [BUESP] - crustose
Frequent on exposed to lightly shaded siliceous rocks in glades and wooded uplands. This species has a thick light gray thallus evocative of the thallus of *Lecanora oreinoides*. Strains with stictic acid and norstictic acid occur in the region. [norstictic and/or stictic acids, \pm atranorin]

Buellia "stigmaea" Tuck. [BUESTG] - crustose
Frequent on lightly shaded siliceous rocks, especially chert fragments and boulders, in woodlands. This species has been confused with *B. spuria*, which has a thicker thallus, immersed apothecia, occurs in more exposed sites, and typically contains stictic acid (occasionally norstictic acid). Local populations tentatively called *B. stigmaea* are characterized by a high concentration of connorstictic acid. [norstictic & connorstictic acids]

Buellia stillingiana J. Steiner [BUESTL] - crustose
Common on boles and branches of a variety of hardwoods, in exposed to moderately shaded situations. This species grows on young trees in old fields and along woodland edges, as well as on older trees in mature woodlands. [atranorin and/or norstictic acid]

Buellia vernicoma (Tuck.) Tuck. [BUEVE] - crustose
Local on lightly shaded sandstone or igneous rocks, on both outcrops and massive boulders, invariably associated with and often growing upon thalli of *Pertusaria plittiana* or *Phlyctis argena*. [xanthone]

CALICIUM Pers. (Caliciaceae)

Corticolous or lignicolous crustose lichens with thin to obscure, grayish thalli and small, dark, urceolate to cylindrical, stipitate apothecia, photobiont *Trebouxia*, asci disintegrating early into a

mazaedium with numerous small, ellipsoid greenish, 1-septate spores; 3 species in the region. Reference: Tibell (1975).

1. Lower portion of exciple with brown pruina; spores <5 µm broad *C. salicinum*
1. Pruina lacking or whitish and restricted to margin of exciple; spores prevailing >5 µm broad.
 2. Pruina absent; asci often >40 µm long *C. abietinum*
 2. Margin of exciple white pruinose; asci to 40 µm long *C. glaucellum*

Calicium abietinum Pers. [CALAB] - crustose
 Uncommon on shaded boles of *Pinus echinata* in open woodlands, usually growing near the base of the tree. This species has a darker, less lustrous thallus and stouter fruits than does *Chaenothecopsis nana*, which also occurs on *Pinus echinata*.

Calicium glaucellum Ach. [CALGL] - crustose
 Apparently uncommon or overlooked; known only from decorticate, standing dead *Quercus* in wooded uplands.

Calicium salicinum Pers. [CALSAL] - crustose
 Occasional on wood and bark of *Quercus* in lightly shaded, wooded uplands.

CALOPLACA Th. Fr. (Teloschistaceae)

Crustose to subsquamulose lichens, with thalli ranging from nearly absent to continuous, areolate, subsquamulose, or lobate, apothecia sessile or immersed, thalline margin present or becoming obsolete, photobiont *Trebouxia* (sometimes considered to be "*Pseudotrebouxia*"), asci *Teloschistes*-type, with 8 ellipsoid to ovate, hyaline, polarilocular spores; a poorly understood genus badly in need of revision — in addition to the 13 species currently documented from the region, and the 4 additional species included in the key and likely to occur in the region, there are several other taxa present in the landscape, but variability among species is poorly understood. [orange species reacting K+ magenta contain anthroquinones, usually parietin] References: Wetmore (1994, 1996, 1998).

1. Thallus saxicolous.
 2. Thallus leprose or granular sorediate, yellow to golden.
 3. Thallus leprose, ecorticate, grayish yellow *C. chrysodeta*
 3. Thallus granular sorediate, usually with some corticate areoles, golden to lemon yellow *C. citrina*
 2. Thallus not sorediate, variously colored.
 4. Apothecia K+ magenta, yellow to orange, sessile; thallus K- or K+ magenta.
 5. Thallus well developed, orange, K+ magenta.
 6. Thallus pale yellow to grayish or brownish yellow, thin, continuous to rimose; mostly in shaded habitats; spores >12 µm long *C. flavovirescens*
 6. Thallus orange, areolate; mostly in exposed habitats; spores <12 µm long.
 7. Thallus thick, subsquamulose, the areoles becoming branched and short lobate; on acidic siliceous rocks *C. "squamosa"*
 7. Thallus thin, areolate, the areoles sometimes crenulate or irregular but not becoming branched; on dolomite *C. subsoluta*
 5. Thallus absent or thin and grayish and K-, or restricted to a few small yellow areoles associated with the apothecia and K+ magenta.
 8. Thallus thin, gray; on sandstone; spores narrow, >15 µm long . . . [*C. arenaria*]

8. Thallus absent, or consisting of a few yellow areoles associated with the apothecia; on carbonate or siliceous substrates; spores ovoid-ellipsoid, <15 µm long [C. feracissima]
4. Apothecia K-, black, immersed; thallus K- C. conversa
1. Thallus corticobus.
9. Apothecia and thallus K-.
10. Apothecia dark brown, not pruinose; thallus brownish C. brunneola
10. Apothecia tan to brown, pruinose; thallus pale C. camptidia
9. Apothecia K+ magenta; thallus K- or K+ magenta
11. Thallus pale to grayish, K-.
12. Thallus dark gray; apothecia yellowish orange, with a gray thalline rim C. cerina
12. Thallus pale to light gray; apothecia brownish to deep orange, the rim concolorous with the disk.
13. Apothecia smooth, brown, lustrous, 0.4-0.8 (1) mm diameter, with round margin C. pollinii
13. Apothecia orange, ± dull, mostly >1 mm diameter, with crenulate margin [C. ferruginea]
11. Thallus yellow to orange, K+ magenta.
14. Thallus sorediate.
15. Thallus chrome yellow to pale grayish, thin and ± continuous; in light shade in woodlands C. chrysophthalma
15. Thallus bright orange, areolate; on exposed wood and sometimes bark [C. microphyllina]
14. Thallus not sorediate C. flavorubescens

[Caloplaca arenaria (Pers.) Müll. Arg.] [CALAE] - crustose
An uncommon species of exposed to lightly shaded sandstone elsewhere in the Ozarks, and possibly occurring in the Lower Ozark region. The small, dark orange apothecia and thin gray thallus are diagnostic.

Caloplaca brunneola Wetmore [CALBR] - crustose
Occasional on boles and branches of trees in woodlands, often growing on younger branches, but not one of the earliest pioneer species. This lichen occurs on both hardwoods and *Juniperus virginiana*. It has a darker thallus than does *C. pollinii*, although the apothecia are similar except for their K reaction: K+ magenta in *C. pollinii* and K- in *C. brunneola*.

Caloplaca camptidia (Tuck.) Zahlbr. [CALCA] - crustose
Common on lightly shaded boles of hardwood trees in woodlands. This species is easily separated from other *Caloplaca* species by the tan to brownish, pruinose apothecia, but in the field care must be taken not to confuse it with a *Bacidia* that has pruinose apothecia, such as *B. polychroa*.

Caloplaca cerina (Hedw.) Th. Fr. [CALCE] - crustose
Frequent on lightly shaded boles and branches of trees in woodlands. In areas of extensive woodlands, this species can be part of the early colonizer cohort on young branches, but in areas with extensive disruption of the woodlands it becomes scarce and restricted to older trees. The distinct gray thalline margin of the apothecia is characteristic, although it can become obscure on old apothecia.

Caloplaca chrysodeta (Vain. ex Räsänen) Domb. [CALCD] - crustose
Very rare; on sheltered, dry shaded lower and mid faces of massive dolomite bluffs, usually in areas of high humidity that are protected from direct wetting.

Caloplaca chrysophthalma Degel.

[CALCH] - crustose

Occasional on lightly shaded tree boles, usually in open wooded uplands or along the edges of glades. Although it grows on a variety of hardwoods as well as *Juniperus virginiana*, *Quercus stellata* is overwhelmingly the most common substrate.

Caloplaca citrina (Hoffm.) Th. Fr.

[CALCIT] - crustose

Occasional and local, in sheltered areas on massive rock formations that are subject to relatively high light intensities. Most populations are from carbonate rocks, but it also grows on sandstone when there is overlying dolomite, and presumably, carbonate mineralization of the sandstone. This species grows on overhung vertical faces and under shallow ledges where there is little exposure to rain or runoff. Typical forms of *C. citrina* are entirely granular sorediate, although the soredia are largely corticate and can appear to be almost isidiate. Some populations in the region have marginally sorediate areoles; these have been segregated as variety *flavocitrina* (Nyl.) A. E. Wade, but this element intergrades completely with the typical morphology.

Caloplaca conversa (Kremp.) Jatta

[CALCO] - crustose

Known only from a single collection on exposed rhyolite along a permanent stream. This species has immersed black apothecia and appears more like an *Aspicilia* than a *Caloplaca*.

[**Caloplaca feracissima** H. Magn.]

[CALFEA] - crustose

Although not yet documented from the Lower Ozarks, this lichen is ubiquitous on disturbed carbonate substrates in the Midwest and undoubtedly occurs here. It is a common species of limestone, concrete, and mortar, and usually occurs in anthropogenically disrupted areas, although occasionally it can be found in glades.

[**Caloplaca ferruginea** (Huds.) Th. Fr.]

[CALFEU] - crustose

This species occurs elsewhere in the Ozarks, and appears to have a predilection for lightly shaded boles and branches of *Juniperus virginiana*. The pale thallus and relatively large, orange apothecia, typically with crenulate margins, are diagnostic.

Caloplaca flavorubescens (Huds.) J. R. Laundon

[CALFLR] - crustose

In the Ozarks, this is an uncommon but widely distributed species of the lower boles of trees, particularly *Quercus velutina*, in open situations, such as along glade margins and on open ridgetops.

Caloplaca flavovirescens (Wulfen) Dalla Torre & Samth.

[CALFLV] - crustose

Very common on shaded rocks, occurring on both carbonate and siliceous substrates. This species also colonizes old concrete and stone work in lightly shaded areas.

Apothecia of *C. flavovirescens* are occasionally parasitized by *Muellerella lichenicola* (Sommerf. ex Fr.) D. Hawksw., a peritheciate fungus with polysporous asci and septate, brown ascospores.

[**Caloplaca microphyllina** (Tuck.) Hasse]

[CALMI] - crustose

Uncommon in woodland areas. Although known from adjacent portions of the Ozarks, this is primarily a species of decorticate wood, and occasionally exposed bark, in prairie regions. Weathered, exposed decorticate fenceposts made from *Juniperus virginiana* or *Maclura pomifera* are typical substrates, and it may occur on fence posts in pasture districts of the Lower Ozarks.

Caloplaca pollinii (A. Massal.) Jatta

[CALPO] - crustose

Frequent on lightly shaded twigs, and occasionally on tree boles. This species occurs on a variety of hardwoods, as well as on *Juniperus virginiana*.

Caloplaca "squamosa" (de Lesd.) Zahlbr.

[CALSQ] - crustose

This species is local on chert fragments associated with weathered dolomite exposures in glades. It usually grows in close association with other lichens, and sometimes appears to be somewhat parasitic. *Caloplaca squamosa* may not be the correct name for this distinctive, subsquamulose lichen — it also matches fairly well the description for *C. inconnexa* (Nyl.) Zahlbr. The apothecia are

essentially concolorous with the thallus, with the thalline margins of the apothecia slightly lighter. The spores are relatively small, ranging to ca. 12 μm long, with a broad isthmus typically exceeding 4.5 μm .

Caloplaca subsoluta (Nyl.) Zahlbr.

[CALSU] - crustose

Common on exposed dolomite on glades and bluffs, and occasionally on lightly shaded carbonate substrates and rarely on siliceous rocks. As used here, this is a variable species, ranging from a well developed areolate thallus to scattered apothecia and scant areoles.

CANDELARIA A. Massal. (Candelariaceae)

Small, lemon yellow foliose lichens with a pale, rhizinate lower cortex, and sessile apothecia with a well-developed thalline margin, photobiont *Trebouxia*, asci *Candelaria*-type, with 16-32 hyaline, ellipsoid, simple (rarely 1-septate) spores; 2 species in the region.

Thallus sorediate, individual thalli small and irregular; apothecia lacking *C. concolor*

Thallus esorediate, individual thalli round and well-delimited; apothecia common *C. fibrosa*

Candelaria concolor (Dicks.) Stein

[CANCO] - foliose

Very common on a wide variety of corticolous substrates, as well as lignum, shaded rocks, and anthropogenic substrates such as concrete, rusted iron, asphalt shingles, and even old tires and vinyl. This species is especially common in sheltered areas and crevices of tree boles where saturation from rainfall is infrequent. The lichen may be more common in wooded uplands than would first appear; often there are only minute, scattered, individual thalli of 2 mm or less on a tree bole, and these thalli are pervasively distributed through the woodland, although not initially apparent. Forms that are almost totally composed of masses of soredia have been referred to as var. *effusa* (Tuck.) Burnham, but there appears to be a full range of intergrading morphologies. [calycin]

Candelaria fibrosa (Fr.) Müll. Arg.

[CANFI] - foliose

Occasional on exposed upper branches of canopy trees in mature woodlands, and less commonly on younger trees in light shade. This species also occurs rarely on lightly shaded rocks. [calycin]

CANDELARIELLA Müll. Arg. (Candelariaceae)

Granulose to minutely subsquamulose, lemon yellow crustose lichens with small, sessile, concave, yellow apothecia with a thalline margin, photobiont *Trebouxia*, asci *Candelaria*-type, with 8-32 small, hyaline, ellipsoid, simple (occasionally 1-septate) spores; 3 species in the region.

1. Thallus sorediate, sometimes consisting of discrete patches of soredia with no apparent thallus; spores 8 per ascus *C. reflexa*

1. Thallus esorediate, although sometimes consisting of aggregations of minute, corticate, spheroid granules; spores 12-32 per ascus.

2. Thallus saxicolous, subsquamulose *C. vitellina*

2. Thallus corticolous, of minute, corticate, spheroid granules *C. xanthostigma*

Candelariella reflexa (Nyl.) Lettau

[CANRE] - crustose

Infrequent on exposed to lightly shaded corticolous substrates, especially twigs of small trees on glades. Sterile sorediate corticolous *Candelariella* thalli are occasional throughout the region, and vastly outnumber fertile material. Sterile material of *C. reflexa* appears identical to *C. efflorescens* R. C. Harris & Buck, an eastern species with 32 spores per ascus, but since all fertile material known from the Interior Highlands has eight spores per ascus, sterile material is defaulted to *C. reflexa*. [calycin]

Candelariella vitellina (Hoffm.) Müll. Arg. [CANVI] - crustose
Local on exposed, massive siliceous substrates, including sandstone and chert in glades and on bluffs; infrequently found on lightly shaded sandstone. [calycin]

Candelariella xanthostigma (Ach.) Lettau [CANXA] - crustose
Occasional on exposed to lightly shaded, hardwoods, typically on mid-boles of larger trees in wooded uplands. This species is never dominant, but occurs as diffuse or solitary patches, typically among other lichens on furrowed or irregular bark. [calycin]

CANOMACULINA Elix & Hale (Parmeliaceae)

Broad lobed, light gray foliose lichens with pale to dark, rhizinate lower cortex, usually with fine short rhizines intermixed with longer rhizines, apothecia sessile, with a thalline margin, photobiont *Trebouxia*, asci *Lecanora*-type, with 8 simple, hyaline, ellipsoid spores; 3 species in the region. See key to *Parmotrema*. References: Elix (1997), Hale (1977), Kurokawa (1991).

1. Thallus sorediate *C. conferenda*

2. Thallus isidiate.

2. Medulla K+ red (salazinic acid) *C. subtinctoria*

2. Medulla K- *C. haitiensis*

Canomaculina conferenda (Hale) Elix [CAMCO] - foliose
Rare on lightly shaded boles of hardwoods in uplands, typically on trees in or bordering glades. [atranorin, norlobaridone]

Canomaculina haitiensis (Hale) Elix [CAMHA] - foliose
Locally frequent in habitats similar to those of the *C. subtinctoria*, with which it is considered conspecific by some. [atranorin, norlobaridone]

Canomaculina subtinctoria (Zahlbr.) Elix [CAMSUBT] - foliose
Frequent on mid and lower boles of hardwood trees in mature woodlands, as well as on *Juniperus virginiana*. Locally, this species is more common than the closely related *C. haitiensis*. [atranorin, norlobaridone, salazinic acid]

CANOPARMELIA Elix & Hale (Parmeliaceae)

Gray foliose lichens with moderate to broad lobes, sorediate or isidiate, with a dark, rhizinate lower cortex, apothecia usually absent, sessile, brown, with a thalline margin, photobiont *Trebouxia*, asci *Lecanora*-type, with 8 simple, hyaline, ellipsoid spores; 3 species in the region.

1. Thallus isidiate, the upper cortex smooth, but with fine white reticulate marks; substrate almost always *Pinus* or *Juniperus* *C. caroliniana*

1. Thallus sorediate, upper cortex sometimes ridged but lacking reticulate white marks; substrate various.

2. Upper cortex smooth, not notably ridged; soralia more or less rounded; medulla K- *C. texana*

2. Upper cortex strongly reticulate ridged, the ridges often sorediate; medulla K+ yellow *C. crozalsiana*

Canoparmelia caroliniana (Nyl.) Elix & Hale [CANCA] - foliose
Infrequent on lower boles of *Juniperus virginiana* and *Pinus echinata* in lightly shaded situations, including open wooded uplands and on *Juniperus* along bluffs. Despite the proliferation of *Juniperus* in the area during the last century, this lichen appears to be confined to sites with remnant natural integrity, and a cohort of old growth conifers. [atranorin, perlatolic acid]

Canoparmelia crozalsiana (de Lesd. *ex* Harm.) Elix & Hale [CANCN] - foliose
Uncommon and sporadic; found as occasional individual thalli, usually on boles of hardwoods in light shade, often in sites with a history of previous disturbance. [atranorin, stictic acid]

Canoparmelia texana (Tuck.) Elix & Hale [CANTE] - foliose
Occasional to locally common on a variety of trees including both hardwoods and softwoods, in wooded uplands. This species occurs in very light shade, both on the boles of larger trees as well as on branches, shrubs, and small saplings. [atranorin, divaricatic acid]

CATILLARIA A. Massal. (Catillariaceae)

Small crustose lichens with thin to obscure thalli and small, dark, sessile, usually convex apothecia, photobiont *Dictyochloropsis*, asci *Catillaria*-type, with 8 small, hyaline, narrowly ovoid, 1-septate spores; 2 species in the region.

1. Saxicolous on calcareous rocks; apothecia brown *C. lenticularis*
1. Corticolous; apothecia black *C. nigroclavata*

Catillaria lenticularis (Ach.) Th. Fr. [CATLE] - crustose
Rare or overlooked; on lightly shaded dolomite. This species has small, chestnut brown, strongly convex apothecia on a thin, sordid thallus.

Catillaria nigroclavata (Nyl.) Schuler [CATNI] - crustose
Uncommon on exposed to lightly shaded twigs, branches, and small tree boles in thickets, occurring on hardwoods and *Juniperus*.

CHAENOTHECA Th. Fr. (Coniocybaceae)

Crustose lichens with thin or obscure thalli and dark, stipitate, globose to subcylindrical apothecia, photobiont *Stichococcus* or chlorococcoid, asci disintegrating early into a mazaeium with numerous, minute, brown or greenish, simple, globose spores; 2 species in the region.

1. Photobiont *Stichococcus*, the cells elongate, <10 µm wide; apothecia with yellow-green pruina; spores 2-3 µm diameter *C. furfuracea*
1. Photobiont chlorococcoid, the cells rounded, 10-15 µm diameter; apothecia with white pruina or pruina absent; spores 3.5-4.5 µm diameter *C. brunneola*

Chaenotheca brunneola (Ach.) Müll. Arg. [CHABR] - crustose
Known from a William Buck collection from (Buck 18115, NY) from a mesic site in Carter County, growing on hardwoods.

Chaenotheca furfuracea (L.) Tibell [CHAFU] - crustose
Known from rhyolite at Prairie Hollow Gorge in Shannon County.

CHAENOTHECOPSIS Vain. (Mycocaliciaceae)

Corticolous crustose fungi with thin, whitish thalli and minute, stipitate, subglobose, black apothecia, photobiont lacking (although Purvis *et al.* [1992] mention that in the British Isles 2 of our species, *C. pusilla* and *C. savonica*, are associated with chlorophycean algae), asci narrowly cylindrical, with a broad apical dome penetrated by a central canal, asci with 8 brown, ellipsoid, simple to 1-septate spores — the asci tardily disintegrating as the spores mature; 3 species in the region.

1. Spores 1-septate *C. pusilla*

1. Spores simple.

2. On bark of *Pinus* *C. nana*

2. On bark of hardwoods or lignum of rotting logs *C. savonica*

Chaenothecopsis nana Tibell

[CHANA] - crustose

Locally frequent on exposed to more often lightly shaded bark of *Pinus echinata*, usually growing on the lower bole and base, especially on trees with well-developed plates and furrows in the bark. Frequently the lower boles of *Pinus echinata* in wooded uplands have small sterile white patches that are presumably this species.

Chaenothecopsis pusilla (Ach.) A.F.W. Schmidt

[CHAPU] - crustose

Rare on well drained decorticate *Pinus echinata* in wooded uplands, usually in areas sheltered from much direct water contact.

Chaenothecopsis savonica (Räsänen) Tibell

[CHASA] - crustose

Apparently rare in the Lower Ozarks; known from a decorticate fallen *Pinus* log in a wooded upland.

CHROMATOCLAMYS Trev. (Thelenellaceae)

Pale gray crustose lichens with thalli growing conformably over bryophytes, with brown perithecia, photobiont cf. *Trebouxia*, asci fissitunicate, I-, with 2-4 hyaline to brownish, muriform ascospores; 1 species in the region.

Chromatoclamys muscorum (Fr.) Mayrh. & Poelt

[CHRMU] - crustose

Uncommon over (usually pleurocarpous) bryophytes in mesic microhabitats in wooded uplands, typically growing on or near shaded dolomite.

CHRYSOTHRIX Mont. (Chrysothrichaceae)

Bright yellow leprose lichens with ecorticate, unstratified thalli, prothallus apparently lacking photobiont chlorococcoid, local material always sterile, but apothecia reported to be tiny, sessile, with a thin ecorticate margin, asci with the inner wall extended into an H+ blue tube, with 8 hyaline, ellipsoid, 3 septate spores; 2 species in the region.

1. Thallus corticolous, K- *C. candelaris*

1. Thallus saxicolous, K+ reddish *C. chlorina*

Chrysothrix candelaris (L.) J.R. Laundon

[CHRC A] - crustose

Occasional on boles of trees in woodlands, usually in mesic sites such as along streams or on talus slopes. The thalli occur in zones not subject to water runoff, such as on the underside of leaning trees. *Acer saccharum* seems to be a preferred substrate. [calycin and/or pinastric acid]

Chrysothrix chlorina (Ach.) J.R. Laundon

[CHRC H] - crustose

Local in sheltered crevices and under overhangs of massive siliceous rock exposures on glades and bluffs. This species occurs on both igneous rocks and sandstone. Local population usually have high concentrations of calycin and react K+ reddish. [calycin, vulpinic acid]

CLADINA Nyl. (Cladoniaceae)

Abundantly branched fruticose lichens without squamules or an evident primary thallus, branches terete and hollow, apothecia globose and terminal, but usually absent, photobiont *Trebouxia*, asci with

a thickened I+ blue apical dome, with 8 hyaline, ellipsoid, simple spores; 3 species in the region. This genus is sometimes included within *Cladonia*.

1. Podetia white, K+ yellowish (atranorin) *C. rangiferina*

1. Podetia green or greenish gray, K-.

2. Ultimate branches appearing windswept and strongly oriented in one direction, usually 4 at each terminal node *C. arbuscula*

2. Ultimate branches not strongly oriented in one direction, often 2-3, sometimes 4, at each terminal node *C. subtenuis*

Cladina arbuscula (Wallr.) Hale & W. L. Culb. [CLAAR] - fruticose
Rare on cherty, well drained ridges and upper slopes in light shade. The podetia of this species appear slightly more robust than those of *C. subtenuis*. [fumarprotocetraric & usnic acids]

Cladina rangiferina (L.) Nyl. [CLARA] - fruticose
Local in acidic, well drained areas with slight shade, such as on massive exposures of siliceous rocks or at the edges of glades. This species occurs on both sandstone and igneous sites. The ashy white thallus is distinctive. [atranorin, fumarprotocetraric acid]

Cladina subtenuis (Abbayes) Hale & W. L. Culb. [CLASU] - fruticose
Frequent in well drained acidic soils, typically in light shade. Typical habitats include wooded upland slopes in soils derived from chert, sandstone, or igneous parent materials, along roads through wooded uplands, and in upland old fields. This species also occurs on rotting decorticate logs in wooded uplands. [fumarprotocetraric & usnic acids]

CLADONIA P. Browne (Cladoniaceae)

Fruticose lichens with well developed, usually persistent, basal squamules having an evident upper cortex, apothecia convex to globose, sessile on the squamules to terminal on well-developed attenuate, blunt, or cupuli form, branched or simple podetia, the podetia sometimes squamulose, in some species the podetia typically remaining sterile, photobiont *Trebouxia*, asci with thickened I+ blue apical dome, with 8 hyaline, simple, fusiform to ellipsoid or ovoid spores; 34 species in the region — several other species have been documented just outside the Lower Ozarks and are likely to occur in the region. References: Thomson (1967).

Key to the species groups of *Cladonia* in the Lower Ozarks

1. Thallus, even when well-developed, consisting only of squamules; commonly sterile or with sessile or subsessile apothecia; podetia absent or always <5 mm long **Key A**

1. Thallus with well-developed sterile or fertile podetia >5 mm long, these pointed, branched, clavate, or cupuliform; sterile or fertile.

2. Podetia forming distinct cups **Key B**

2. Podetia prevailingly not forming cups — occasionally a few podetia will have small, shallow, poorly developed cups.

3. Podetia abundantly and repeatedly branched, typically >5 cm long; esorediate **Key C**

3. Podetia simple or forked to sparingly branched, typically <5 cm long; sorediate or esorediate **Key D**

Key A: squamulose; podetia tiny or absent

1. Squamules C+ blue-green (strepsilin present) *C. strepsilis*

1. Squamules C- or C+ yellowish (strepsilin absent).

2. Apothecia present and/or minute podetia present, the apothecia sessile on squamules or on the podetia.

3. Apothecia present, sessile or on tiny podetia.
 4. Apothecia on minute, delicate podetia; thallus K+ deep yellow, P+ yellow (thamnolic acid present, fumarprotocetraric acid absent) *C. parasitica*
 4. Apothecia sessile; thallus K-, P+ red (thamnolic acid absent, fumarprotocetraric acid present) *C. caespiticia*
3. Apothecia lacking; tiny pointed podetia present *C. macilenta* var. *bacillaris*
2. Apothecia lacking.
 5. Squamules K+ yellow turning red (norstictic acid present).
 6. Atranorin present; rare *C. symphycarpa*
 6. Atranorin absent; common *C. polycarpoides*
 5. Squamules K- or K+ persistently yellow (norstictic acid absent).
 7. Squamules K+ deep or pale yellow (atranorin or thamnolic acid present).
 8. Squamules sorediate, K+ deep yellow (thamnolic acid present) *C. ravenelii*
 8. Squamules esorediate, K+ pale yellow (thamnolic acid absent).
 9. Squamules P+ yellow (fumarprotocetraric acid absent) *C. cariosa*
 9. Squamules P+ red (fumarprotocetraric acid present).
 10. Squamules long and strap-shaped, often exceeding 7 mm long; sphaerophorin absent; on exposed to lightly shaded soil *C. apodocarpa*
 10. Squamules shorter, usually <5 mm long; sphaerophorin present; on shaded siliceous rocks in mesic sites *C. petrophila*
 7. Squamules K- (atranorin and thamnolic acid absent).
 11. Squamules sorediate, sometimes coalescing into masses of soredia . . . *C. ramulosa*
 11. Squamules esorediate.
 12. Squamules greenish yellow, containing usnic acid.
 13. Squamules large and strap-shaped, some usually 5 mm or more long; barbatic acid present *C. robbinsii*
 13. Squamules small and rounded, <2.5 mm long; barbatic acid absent *C. piedmontensis*
 12. Squamules brown to green or gray-green, usnic acid absent.
 13. Grayanic acid present; terricolous, saxicolous, corticolous or lignicolous.
 14. Squamules to ca. 1 mm long and usually about as broad, often marginally sorediate; on lignum *C. cylindrica*
 14. Larger squamules usually at least 2 mm long and notably longer than broad, marginal soredia absent; substrates various but typically terricolous or saxicolous *C. grayi*
 13. Grayanic acid absent; terricolous or saxicolous.
 15. Squamules broadly expanded, brownish green above and sordid or brownish white below; on massive acidic rock exposures *C. mateocyatha*
 15. Squamules narrow and strap-shaped, greenish above and chalky white beneath; terricolous *C. sobolescens*

Key B: podetia forming cups

1. Cups esorediate, sometimes with coarse greenish areoles.
2. Cups proliferating from their centers, the podetia with two or more pagoda-like tiers of cups *C. cervicornis* ssp. *verticillata*

2. Cups not proliferating from their centers — occasionally a few smaller cups along the margins of the main cups *C. pyxidata*
1. Cups sorediate, the soredia farinose to granular.
 3. Podetia yellow green, with usnic acid; apothecia and pycnidia red *C. pleurota*
 3. Podetia green to gray green, without usnic acid; apothecia and pycnidia brown (*C. chlorophaea* group - chromatography needed for accurate identification).
 4. Grayanic acid present; terricolous, saxicolous, or corticolous, cups sometimes very irregular and marginally proliferating *C. grayi*
 4. Grayanic acid absent; terricolous; cups not marginally proliferating in local populations.
 5. Cryptochlorophaeic acid present *C. cryptochlorophaea*
 5. Cryptochlorophaeic acid absent *C. chlorophaea*

Key C: podetia branched

1. Podetia gray green; usnic acid absent; podetia usually squamulose *C. furcata*
1. Podetia yellow green; usnic acid present; podetia never squamulose.
 2. Podetia leathery; cortex wrinkled; apothecia and pycnidia red *C. leporina*
 2. Podetia brittle; cortex not wrinkled; apothecia and pycnidia brown.
 3. UV+ white (squamic acid); cortex shiny and areolate; podetia uniformly thin . . . *C. uncialis*
 3. UV- (squamic acid absent); cortex dull, areoles not well-defined; podetia irregularly thickened

Key D: podetia simple

1. Podetia sorediate.
 2. Apothecia and pycnidia red; barbatic and/or didymic acids present.
 3. Thallus instantly K+ deep yellow (thamnolic acid); restricted to wood and bark of *Pinus* and *Juniperus* *C. ravenelii*
 3. Thallus K- or K+ weakly yellowish (thamnolic acid lacking); substrate various, especially rotting, decorticate hardwood logs.
 4. Squamules sorediate, entire to lobed; podetia with well developed farinose soredia *C. macilenta* var. *bacillaris*
 4. Squamules esorediate, finely divided; podetia finely squamulose, with sparse soredia *C. didyma*
 2. Apothecia and pycnidia brown; barbatic acid absent.
 5. Squamules prevailing >2.5 mm long.
 6. At least some podetia with corticate bases and rounded soralia; squamules incised *C. ochrochlora*
 6. Podetia farinose sorediate except near base; squamules lobed to entire . . . *C. coniocraea*
 5. Squamules prevailing 2 mm or less long.
 7. Grayanic acid present; podetia narrowly clavate, with blunt tips, covered with coarse isidioid granules *C. cylindrica*
 7. Grayanic acid absent; podetia pointed or tipped with apothecia, covered with farinose soredia.
 8. Podetia small and pointed, usually <10mm long; soredia farinose *C. ramulosa*
 8. Podetia stout, often tipped with apothecia, prevailing >10 mm long; soredia granular isidioid [*C. subradiata*]
1. Podetia lacking soredia.
 9. Podetia small and delicate, <8 mm tall, isidioid granule, K+ instantly deep yellow (thamnolic acid)

9. Podetia stouter and larger, usually >10 mm tall, corticate or ecorticate, but not isidioid squamulose, K-, K+ yellowish, or K+ red (thamnolic acid absent).

10. Apothecia and pycnidia red; didymic acid present *C. cristatella*

10. Apothecia and pycnidia brown; didymic acid absent.

11. Podetia bearing squamules.

12. Podetia UV- (squamatic acid absent), P+ red (fumarprotocetraric acid present)
. *C. furcata*

12. Podetia UV+ white (squamatic acid present), P- or P+ yellow (fumarprotocetraric acid absent).

13. Podetia P+ yellow (baeomycic and/or barbatic acid present) . . . [*C. atlantica*]

13. Podetia P- (squamatic acid only) *C. squamosa*

11. Podetia mostly lacking squamules.

14. Podetia and squamules K+ yellow turning red (norstictic acid present)
. *C. polycarpoides*

14. Podetia and squamules K- or K+ yellow (norstictic acid absent).

15. Podetia and squamules with a distinct yellowish green color (usnic acid present)
. *C. piedmontensis*

15. Podetia and squamules green to gray green (usnic acid absent).

16. Podetia and squamules P+ yellow (atranorin present, fumarprotocetraric acid absent) *C. cariosa*

16. Podetia and squamules P+ red (atranorin absent, fumarprotocetraric acid present).

17. Podetia stout, with thick walls and a small central cavity; apothecia present.

18. Apothecia flesh colored to tan; squamules <2 mm long
. *C. peziziformis*

18. Apothecia dark brown; squamules large, mostly >2 mm long . .
. *C. sobolescens*

17. Podetia slender, with thin walls and a large central cavity; often sterile
. *C. simulata*

Cladonia apodocarpa Robbins

[CDAPO] - fruticose

Common on well-drained, acidic, often rocky soil, in both full sun and light shade. The characteristic habitat for this species is well-drained, rocky sites on ridges and upper slopes in woodlands. This species and *C. robbinsii* have the largest squamules of the local *Cladonia* flora. [atranorin, fumarprotocetraric acid]

[Cladonia atlantica A. Evans]

[CDATL] - fruticose

This is a species of massive, shaded, well drained, usually vertical or steeply sloping siliceous rock outcrops in mesic areas. It occurs just north and east of the region, and is likely to be found within the Lower Ozarks. It is morphologically similar to some local populations of *C. squamosa*, which has a similar ecology. [baeomycic & squamatic acids, ± barbatic acid]

Cladonia caespiticia (Pers.) Flörke

[CDCAE] - fruticose

Uncommon or overlooked, growing on shaded rocky soil, rocks, and rotting logs in woodlands, often in somewhat mesic sites. The apothecia are sessile or subsessile on the squamules. [fumarprotocetraric acid]

Cladonia cariosa (Ach.) Spreng.

[CDCAR] - fruticose

Uncommon, on exposed, well-drained acidic soil. Thesquamules are large, and typically form loose patches. This is the only species of *Cladonia* that contains atranorin as the sole lichen substance, although most populations east of the Ozarks also contain fumarprotocetraric acid. [atranorin]

Cladonia cervicornis (Ach.) Flot. ssp. **verticillata** (Hoffm.) Ahti [CDVER] - fruticose
Very rare in well-drained, rocky, acidic sites. Most records from the Ozarks, including all from the region, are based on historical specimens. The pagoda-like towers of centrally proliferating cups are unmistakable. [fumarprotocetraric acid]

Cladonia chlorophaea (Flörke ex Sommerf.) Spreng. [CDCHL] - fruticose
Occasional in lightly shaded, well-drained, often mossy sites, growing over soil and rocks. This is the least common of the four members of the *Cladonia chlorophaea* group in the local lichen flora. [fumarprotocetraric acid]

Cladonia coniocraea (Flörke) Spreng. [CDCON] - fruticose
Apparently rare, usually occurring with habitats and substrates similar to those of *C. ochrochlora*, which see. These two species form a confusing complex of morphologies. [fumarprotocetraric acid]

Cladonia cristatella Tuck. [CDCRI] - fruticose
Abundant in well-drained, acidic substrates, in both exposed and lightly shaded sites. Typical substrates include well-drained decorticate logs, stumps, rocky soil, and boulders. This species is common in rocky soil on sterile ridges in wooded uplands, and also frequents sterile, well-drained soil in open abandoned fields. The red apothecia and esorediate podetia are diagnostic. Most material in the region contains usnic acid and has characteristic yellow green podetia, but there are occasional forms lacking usnic acid. These populations have ashy gray podetia, and sometimes occur mixed with typical populations. Forms with pale or orange apothecia also occur from time to time. [barbatic & didymic acids, ± usnic acid]

Cladonia cryptochlorophaea Asahina [CDCRY] - fruticose
Occasional in rocky, well drained soil, usually in light shade. This species usually has well-defined, regular cups, with little variation or marginal proliferation. Although difficult to describe, it has a distinctive gestalt once one becomes familiar with it. It is more common than most of the cup-forming *Cladonia* in the region, but far less common, variable, or ecologically plastic than *C. grayi*. [cryptochlorophaeic acid, ± atranorin, ± fumarprotocetraric acid]

Cladonia cylindrica (A. Evans) A. Evans [CDCYL] - fruticose
Occasional to frequent, usually growing on shaded, decorticate, rotting logs in dry to mesic woodlands, but occasionally found on mesic mossy rocks. The small, bluntish podetia with isidioid granules at least on the lower portions are good field identification characters. [fumarprotocetraric & grayanic acids]

Cladonia didyma (Fée) Vain. [CDDID] - fruticose
Uncommon on well drained, rotting decorticate logs in wooded uplands. This species is usually slightly larger than the more common *C. macilenta* var. *bacillaris*. [barbatic & didymic acids]

Cladonia dimorphoclada Robbins [CDDIM] - fruticose
Locally abundant in exposed, well-drained areas with massive exposures of siliceous rock, where competition from vascular vegetation is minimal. This is a characteristic lichen of both sandstone and igneous glades, forming extensive mats over large areas. In this habitat it often occurs with two similar taxa, *C. leporina* and *C. uncialis*, as well as vascular taxa such as *Bulbostylis capillaris*, *Diodia teres*, *Hypericum gentianoides*, *Lechea tenuifolia*, and *Vulpia octoflora*. When dry, it is easily damaged by trampling. Local populations may represent a distinct taxon, and are characterized by an unevenly thickened, irregular thallus. The cortex of the podetia is notably uneven, dull, and without conspicuous areoles. *Cladonia uncialis* has more regular, thinner podetia, with a shiny areolate-patterned cortex. *Cladonia leporina* differs in its leathery podetia with a wrinkled cortex, as opposed to the brittle, unwrinkled cortex of both *C. dimorphoclada* and *C. uncialis*. [usnic acid]

Cladonia furcata (Huds.) Schrad. [CDFUR] - fruticose
Occasional in lightly shaded, well-drained soil on wooded slopes, often associated with *Cladonia subtenuis*. This species is more shade tolerant than *Cladonia subtenuis*, and sometimes forms extensive populations of scattered patches in wooded uplands, particularly where vascular competition at the ground level is sparse, such as around old turkey scratching areas. [fumarprotocetraric acid]

Cladonia grayi G. Merr. ex Sandst. [CDGRY] - fruticose
Very common, with a variety of habitats and substrates. This is the most common, morphologically variable, and ecologically plastic of our cup-forming *Cladonia* species. It is nearly ubiquitous in lightly shaded rocky woodlands, occurring in open well-drained soil, on moss mats, and on siliceous boulders and rock fragments. This species also occurs on rotting logs, shaded lower faces of massive bluffs and outcrops, and even on tree boles. The cups range in size from a few mm to more than 3 cm, with a bewildering array of shapes and degrees of marginal proliferation. Lower Ozark material is about evenly divided between populations with and without fumarprotocetraric acid. [grayanic acid, ± fumarprotocetraric acid]

Cladonia leporina Fr. [CDLEP] - fruticose
Uncommon and restricted to high quality igneous glades, where it occurs over massive rock exposures, usually among mats of *C. dimorphoclada*. This southeastern species is at the extreme northern limit of its interior range in the Lower Ozarks. [baeomycic, squamatic, & usnic acids, ± bellidiflorin, ± didymic acid]

Cladonia macilenta Hoffm. var. **bacillaris** (Genth) Schaer. [CDBAC] - fruticose
Common on rotting decorticate logs and stumps in light to moderate shade in woodlands. This lichen is also a characteristic species on the bases of *Pinus echinata* in wooded uplands, and also occurs less commonly on shaded bases of large hardwood trees. This species is typically sterile, and care must be taken to note the sometimes obscure red pycnidia, which can become somewhat brownish with age. [barbatic acid, ± didymic & usnic acids]

Cladonia mateocyatha Robbins [CDMAT] - fruticose
Uncommon and local, on massive siliceous rock expanses in glades, occurring on both sandstone and igneous substrates, and sometimes growing in thin soil over bedrock expanses. This species has large, rounded, brownish squamules with a dingy, brownish white undersurface. Our populations invariably consist of sterile squamules. [fumarprotocetraric acid]

Cladonia ochrochlora Flörke [CDOCH] - fruticose
Frequent on rotting logs, stumps, and mossy boulders in mesic sites, particularly in wooded ravines and woodlands along streams. This species is closely related to *C. coniocraea*, although as interpreted here, *C. ochrochlora* is the more common element in the region. *Cladonia ochrochlora* has the podetia basally corticate with a few rounded soralia, and usually has larger squamules than *C. coniocraea*. [fumarprotocetraric acid]

Cladonia parasitica (Hoffm.) Hoffm. [CDPAR] - fruticose
Locally frequent on rotting decorticate logs in woodlands, including well-rotted logs near the point of disintegration. This species occurs in habitats ranging from mesic to dry, and can be recognized by the tiny, delicate, dark green podetia, and abundant small, dark brown apothecia. [decarboxythamnolic & thamnolic acids, ± barbatic acid, ± bellidiflorin]

Cladonia petrophila R. C. Harris [CDPET] - fruticose
Restricted to shaded outcrops and boulders of siliceous rocks, usually in mesic areas such as ravines and along the bases of bluffs. This species usually grows as extensive, flattened patches of somewhat widely spaced squamules, and displays a predilection for vertical or steeply sloping rock surfaces. [atranorin, sphaerophorin, fumarprotocetraric acid]

Cladonia peziziformis (With.) J. R. Laundon [CDPEZ] - fruticose

Very common on well-drained soil, lignum, rocks, and tree bases in a variety of exposed to shaded habitats. This is one of the first pioneer lichens to invade abandoned fields and road cuts. It is also one of the few species of *Cladonia* to inhabit dolomite as well as siliceous rocks. The tiny, pale greenish gray squamules in small dense patches, and the tan apothecia terminating the twisted podetia are diagnostic. [fumarprotocetraric acid]

Cladonia piedmontensis G. Merr. [CDPIE] - fruticose
Occasional but seldom abundant; in sterile, acidic soils in exposed to lightly shaded sites, often occurring in areas with sparse but prominent vascular vegetation. [usnic acid]

Cladonia pleurota (Flörke) Schaer. [CDPLE] - fruticose
Frequent in well-drained acidic soils, often growing in more exposed, acidic sites than other cup forming species of *Cladonia*. This species occurs in siliceous glades and on rocky acidic bluff summits and ridges. It is also found rarely on dry decorticate logs and stumps along glade edges. [usnic acid, zeorin, ± bellediflorin]

Cladonia polycarpoides Nyl. [CDPOLS] - fruticose
Common in sterile, well-drained, acidic soil in exposed areas. This lichen is particularly common in soil derived from cherty parent materials, growing in old fields and along road cuts. It also occurs in openings in wooded uplands. [norstictic acid]

Cladonia pyxidata (L.) Hoffm. [CDPYX] - fruticose
Occasional in rocky open woodlands, growing on rocky soil and often associated with mosses. This species has small, areolate granules on the cups, and care must be taken to distinguish these from the soredia that characterize the other cup-forming species of *Cladonia* in the region. [fumarprotocetraric acid]

Cladonia ramulosa (With.) J. R. Laundon [CDRAM] - fruticose
Occasional, mostly on shaded decorticate logs in woodlands. This name, as it seems to be applied in the Midwest, is a general repository for farinose sorediate, small *Cladonia* containing only fumarprotocetraric acid and having pointed podetia. There may be more than one taxon included conceptually under this name, as local material ranges from well-defined, sorediate-margined squamules with podetia to general masses of squamulose soredia lacking podetia. [fumarprotocetraric acid]

Cladonia ravenelii Tuck. [CDRAV] - fruticose
Locally frequent in exposed to lightly shaded upland sites, where it grows on well-drained bark or wood of *Juniperus virginiana* and *Pinus echinata*. This species occurs on living bark, dead wood, stumps, and charred logs of the host trees. [didymic & thamnolic acids]

Cladonia robbinsii A. Evans [CDROB] - fruticose
Common on sterile, exposed to slightly shaded, rocky soil in uplands, and on massive exposures of siliceous rocks. In acidic rocky soils, particularly in light shade, it often associates with *Cladonia subtenuis* and *Cladonia apodocarpa*. In siliceous glades, *Cladonia dimorphoclada* is a common associate. [barbatic & usnic acids]

Cladonia simulata Robbins [CDSIM] - fruticose
Rare; known only from a Richard Harris collection from Iron County and a Gerould Wilhelm collection from Howell County. Thomson (1967) states that this species has a yellowish green color and resembles *C. piedmontensis*. The Iron County record, and other material from Florida archived at NY, lacks the yellowish green tint and has pointed podetia. [fumarprotocetraric acid]

Cladonia sobolescens Nyl. ex Vain. [CDSOB] - fruticose
Occasional in exposed to lightly shaded, acidic, well-drained soil. This species resembles *C. polycarpoides* in its ecology and morphology, but is less common in the region. [fumarprotocetraric acid]

Cladonia squamosa Hoffm.

[CDSQU] - fruticose

Local in mesic shaded areas, on massive, well drained, usually vertical or steeply sloping siliceous rock outcrops in ravines and on ledges, outcrops, and lower bluff faces. This species sometimes occurs in drier, more exposed sites along the margins of sandstone or igneous glades, or in semi-sheltered areas on rock faces in glades. See discussion under *C. atlantica*. [squamatic acid]

Cladonia strepsilis (Ach.) Grognot

[CDSTR] - fruticose

Local in exposed glades and on bluff summits and exposed ledges, growing over massive exposures of siliceous rock. Infrequently, this species occurs in open xeric wooded uplands, growing in rocky soil on upper slopes and ridges, where associates include such species as *C. apodocarpa* and *C. robbinsii*. [baeomycic acid, strepsilin]

Cladonia subradiata (Vain.) Sandst.

[CDSUB] - fruticose

In the region are populations of an unusual *Cladonia* with partly ecorticate podetia mostly covered with fine, partly corticate, isidioid granules, the podetia with well-developed pale to dark brown apothecia, and basal squamules copiously incised. Sam Hammer (personal communication) has tentatively determined this element as a somewhat anomalous form of *C. subradiata*, a species with affinities to the Gulf Coastal Plain. Our specimens resemble southeastern material in overall aspect, except that local material does not form cups, and the podetia are not squamulose. Ozark specimens are all from rotting decorticate logs. [fumarprotocetraric acid]

Cladonia symphycharpa (Flörke) Fr.

[CDSYM] - fruticose

Known from the region only on the basis of a literature report from Reynolds County, although this species occurs rarely elsewhere in the Ozarks. The large squamules, with a pale gray green upper surface and chalky white lower surface, look like those of *C. apodocarpa*. [atranorin, norstictic acid]

Cladonia uncialis (L.) F. H. Wigg.

[CDUNC] - fruticose

Occasional in open, well-drained sites associated with massive exposures of siliceous rock, occurring on both glades and upper portions of massive bluffs. This species is related to and frequently associated with *C. dimorphoclada*; see also comments under that species. [squamatic & usnic acids]

CLAUZADEA Haffelner & Bellem. (Porpidiaceae)

Saxicolous crusts with obscure, thin or endolithic thalli, photobiont *Trebouxia*, apothecia black to dark purplish brown, plane to convex, sessile to more commonly immersed in pits in the substrate, asci *Porpidia* type, with 8 simple, hyaline, broadly oval spores; 1 species in the region.

Clauzadea metzleri (Körb.) Clauz. & Roux *ex* D. Hawksw.

[CLAME] - crustose

Uncommon on exposed dolomite in glades, growing on both small fragments and massive bedrock exposures.

COCCOCARPIA Pers. (Coccocarpiaceae)

Small, dark lead gray, isidiate foliose lichens with relatively short, broad lobes, lower surface mostly dark, with dense, rhizine-like tomentum, apothecia sessile, photobiont *Scytonema* (in our species), asci with an I+ blue apical cap, with 8 hyaline, ellipsoid, simple spores; 1 species in the region. Reference: Arvidsson (1982).

Coccocarpia palmicola (Spreng) Arv. & D. J. Galloway

[COCPA] - foliose

Occasional on lightly shaded, often mossy, rocks, and less commonly on shaded bases of larger trees in mature woodlands.

COLLEMA F. H. Wigg. (Collemataceae)

Gelatinous lichens with dull, brown to black, undifferentiated thallus, apothecia sessile to immersed, usually with a thalline margin which sometimes becomes obscure to absent at maturity, photobiont *Nostoc*, asci with 8 blue apical dome and apical cap, with 8 hyaline, ellipsoid to acicular, 1-septate to muriform spores; 9 species in the region. The taxonomy of local taxa of *Collema* is confusing, and the following treatment is only provisional. Reference: Degelius (1974).

1. Thallus corticolous.

2. Thallus isidiate.

3. Thallus mostly smooth, without well-developed ridges and pustules on the upper surface of the lobes *C. subflaccidum*

3. Thallus with well-developed ridges and/or pustules on the surface of the lobes.

4. Upper surface of lobes with abundant pustules, the ridges sharply defined; apothecia abundant; isidia globose *C. nigrescens*

4. Upper surface of lobes mostly with rounded ridges and shallow, rounded pustules; apothecia extremely rare and, when present, sparse; isidia becoming cylindrical *C. furfuraceum*

2. Thallus not isidiate, although sometimes pustular.

5. Lobes prevailing >1.5 mm broad, not thickened at tips; spores 5+ septate, >40 µm long *C. nigrescens*

5. Lobes <1 mm broad, thickened at the tips; spores 1-3-septate, <25 µm long *C. conglomeratum*

1. Thallus saxicolous or terricolous.

6. Thallus isidiate.

7. Upper surface with well-defined ridges and pustules; isidia globose *C. furfuraceum*

7. Upper surface lacking ridges and pustules; isidia initially cylindrical, becoming flattened and squamulose with age *C. flaccidum*

6. Thallus lacking isidia.

8. Thallus saxicolous directly on carbonate (rarely sandstone) rock.

9. Apothecia > 0.5 mm broad, sessile to substipitate, with convex disk; spores 1-septate *C. texanum*

9. Apothecia to 0.15 mm broad, immersed, with minute, flat to concave disk; spores submuriform to muriform *C. pustulatum*

8. Thallus terricolous, sometimes in thin soil pockets over rock, or sometimes on mosses over shaded dolomite.

10. Spores 1-septate *C. coccophorum*

10. Spores muriform.

11. Thalline margin of apothecia crenulate to almost lobed; spores >11 µm broad [*C. bachmanianum*]

11. Thalline margin of apothecia essentially smooth; spores to 10 µm broad . . *C. tenax*

[***Collema bachmanianum*** (Fink) Degel.]

[COLBA] - gelatinous

This is a rare lichen of shaded dolomite and limestone, with a recent record from just north of the Lower Ozarks. This species is very similar to *C. tenax*, except for notably crenulate thalline margins of the apothecia.

Collema coccophorum Tuck.

[COLCOC] - gelatinous

Uncommon on shaded soil over dolomite, shaded mossy dolomite, and soil pockets on lower bluff faces and ledges.

Collema conglomeratum Hoffm.

[COLCONN] - gelatinous

Occasional on lightly shaded boles of trees, particularly along glade margins and bluff summits, as well as rarely on lightly shaded dolomite. This species grows most commonly on *Fraxinus americana*, *Juglans nigra*, *Quercus muehlenbergii*, and *Q. stellata*. The small thalli with abundant, closely spaced apothecia are distinctive, and resemble miniature pin cushions. Corticolous populations frequently grow with other gelatinous lichens, especially *Leptogium milligranum*. The vast majority of Ozark material has 1-septate ascospores and is referable to the typical variety. Forms with 3-septate ascospores have been reported from the Ozarks (*i.e.* Hale 1957) as *C. conglomeratum* var. *crassiusculum* (Malme) Degel.

Collema flaccidum (Ach.) Ach.

[COLFL] - gelatinous

Extremely rare on shaded sandstone in wooded uplands.

Collema furfuraceum (Arnold) Du Rietz

[COLFU] - gelatinous

Uncommon on shaded lower boles and bases of trees in wooded uplands, and in mesic woods where there is sufficient light intensity. As used here, this concept also includes material frequently found on moist shaded boulders in ravines which were previously referred to *C. flaccidum*. According to Purvis *et al.* (1992), *C. flaccidum* has isidia which become lobulate or squamulose. Local material has small, fine, globose to cylindrical isidia with no tendency to become flattened or lobulate; these isidia are identical to isidia of local corticolous populations of *C. furfuraceum*.

Collema nigrescens (Huds.) DC.

[COLNI] - gelatinous

Infrequent on lightly shaded tree boles, typically *Quercus alba* or *Q. stellata*. Although this lichen is described as occurring both with and without isidia, local material usually lacks isidia, and isidiate material is very rare. The abundant, small, substipitate apothecia, broad lobes, blackish color, and pustular surface are diagnostic.

Collema pustulatum Ach.

[COLPU] - gelatinous

Infrequent on shaded dolomite boulders, outcrops, and bluff faces, usually in higher light intensities than are favored by other species of *Collema*. This species is characterized by its suberect brown to olive brown thallus that is tough and brittle when dry. Rarely it occurs on lightly shaded sandstone.

Collema subflaccidum Degel.

[COLSU] - gelatinous

Common on shaded mid to lower boles and bases of trees in wooded uplands, in habitats similar to those of *C. furfuraceum*, with which it is sometimes associated.

Collema tenax (Sw.) Ach.

[COLTEN] - gelatinous

Occasional on shaded, moist, often mossy dolomite, often on ledges and boulders along streams or on lower faces of bluffs and ledges. This species grows in thin soil pockets, or over mosses on the rocks.

Collema texanum Tuck.

[COLTEX] - gelatinous

Infrequent on exposed to lightly shaded dolomite exposures, usually in dryish sites such as along glade margins and outcrops on upper slopes in woodlands. This species grows directly on rock exposures, usually in areas with little or no moss. Previous reports of *C. polycarpon* Hoffm. should be referred here; all Missouri and Arkansas material I have seen has consistently 1-septate spores, whereas *C. polycarpon* typically has 3-septate spores.

CONOTREMA Tuck. (Stictidaceae)

Whitish corticolous crustose lichens with a continuous to rimose thallus, apothecia strongly concave, ± immersed in thalline tissue and appearing perithecioid, photobiont *Trebouxia*, asci with a thickened apex, with 8 extremely long, acicular 25+ septate spores with ± spherical cells; 1 species in the region.

Conotrema urceolatum (Ach.) Tuck.

[CONUR] - crustose

Infrequent in lightly shaded dry mesic to mesic woodlands, growing on boles of a variety of hardwood trees, particularly *Acer rubrum*, *Acer saccharum*, and *Quercus coccinea*. A nonlichenized fungus that looks much like this species, *Robergea pupula* (Nyl.) R. C. Harris, occurs on boles and branches of trees in the area, often in more exposed situations. The ascocarp of *Conotrema* opens by a gaping, central pore, while the ascocarp of *Robergea pupula* is offset to the side, with a closed slit set in a white pruinose disk.

CYSTOCOLEUS Thwaites (Agonomycetes: family unknown)

Minute, sterile, branched, black filamentous lichens consisting of undulate hyphae closely enveloping *Trentepohlia* filaments; 1 species in the region.

Cystocoleus ebeneus (Dillwyn) Thwaites [CYSEB] - fruticose
Rare and local; in light to moderate shade on sheltered faces of massive siliceous rock formations, growing in sheltered nooks or under overhangs, in mesic microclimates in areas protected from direct rainfall and runoff.

DENDRISCOCAULON Nyl. (Lobariaceae)

Tiny, sterile, grayish, compact, densely branched subfruticose lichens, with narrow channeled to flattened branches, photobiont *Scytonema* or *Nostoc*; 1 species in the region.

Dendriscocaulon intricatum (Nyl.) Henssen [DENIN] - fruticose
Uncommon on the bases of shaded trees in stable woodlands, growing in a narrow zone near the bark/soil interface on mature trees. Because of its size, habitat, and structure, this species is easily overlooked. One eminent lichenologist has termed this species a "free-living cephalodium"!

DERMATOCARPON Eschw. (Verrucariaceae)

Brown to grayish, umbilicate to subfoliose saxicolous lichens with a smooth to papillate or rugose lower cortex and one or more holdfasts, rhizines present or absent, ascomata immersed perithecia, photobiont *Trebouxia* plus *Protococcus* and/or *Hyalococcus*, asci *Verrucaria*-type, with 8 simple, hyaline, ellipsoid to subglobose spores; at least 2 species in the region, but taxonomy and nomenclature poorly understood, and local material presents a bewildering complex of morphologies and ecologies.

1. Thallus with abundant dark rhizines [*D. moulinsii*]

1. Thallus lacking rhizines.

2. Thallus umbilicate, with a central holdfast; on moist carbonate rock *D. miniatum*

2. Thallus subfoliose, with many rounded lobes and multiple holdfasts; usually on siliceous rocks
. *D. intestiniforme*

Dermatocarpon intestiniforme (Körb.) Hasse [DERIN] - foliose
Common on exposed to shaded siliceous rocks, particularly in areas of seasonal or temporary runoff or seepage, where it can form large mats of convoluted thalli. Local material, although restricted to siliceous rocks, has a dark to more commonly pale lower surface, with few holdfasts, and may actually be referable to *D. miniatum* var. *complicatum* (Lightf.) Hellb.

Dermatocarpon miniatum (L.) W. Mann [DERMI] - foliose
Frequent on moist, shaded, typically vertical or steeply sloping carbonate rock exposures; often growing on lower faces of bluffs and outcrops in ravines. This species is tolerant of low light

intensities, and sometimes grows on mossy, shaded streamside dolomite outcrops in steep-sided ravines, with *Lepraria lobificans* as the sole lichen associate.

[Dermatocarpon moulinsii (Mont.) Zahlbr.]

[DERMO] - foliose

A rare lichen throughout the Ozarks, known only from a few massive dolomite bluffs with old-growth conditions and habitat integrity. In these sites it grows on ledges and faces near the bluff summit. Since suitable type and quality exists along the major rivers in the region, particularly the Eleven Point, Jacks Fork, and Current rivers, this species may occur in the Lower Ozarks.

DIMELAENA Norman (Physciaceae)

Yellow-green saxicolous crustose lichens with rimose to lobate thalli and \pm immersed apothecia, thalline margin absent, photobiont *Trebouxia*, asci *Lecanora*-type, with 8 brown, 1-septate, ellipsoid spores; 1 species in the region.

Dimelae na oreina (Ach.) Norman

[DIMOR] - crustose

Frequent on exposed to lightly shaded siliceous rocks, especially on large rock exposures in glades. Typical associates include *Acarospora fuscata*, *Candelariella vitellina*, *Lecanora oreinoides*, and *Xanthoparmelia* spp. [gyrophoric & usnic acids]

DIMERELLA Trevis. (Gyalectaceae)

Inconspicuous crustose lichens with thin or obscure, ecorticate thalli and sessile, pale to orange apothecia, photobiont *Trentepohlia*, asci simple, with no apical structures or thickenings, with 8 small, ellipsoid, hyaline, 1-septate spores; 2 species in the region.

1. Apothecia to 0.4 mm broad, pale to dull yellowish; mostly lignicolous, or on bryophytes, humus, or tree bases
..... *D. pineti*

1. Apothecia usually > 0.5 mm broad, orange; mostly corticolous *D. lutea*

Dimerella pineti (Ach.) Vězda

[DIMPI] - crustose

Uncommon in shaded sites in dry to mesic woodlands, but small and perhaps overlooked. Known from rotting stumps, and from bryophytes over stable humus.

Dimerella lutea (Dicks.) Trevis.

[DIMLU] - crustose

Apparently rare; on shaded boles of *Quercus velutina*. Elsewhere in the Ozarks, this species grows on bryophytes and humus. Some local material has spores notably longer than are typical for the species, ranging to 14 μ m long.

DIPLOSCHISTES Norman (Telotremataceae)

Crustose lichens with pale gray, continuous to rimose thalli, immersed, urceolate apothecia, photobiont *Trebouxia*, asci with internal thickening, internally I+ orange, with 4-8, greenish to brown, muriform spores; 3 species in the region.

1. Exciple radially striate, the striations usually white to pale; thallus generally rimose or of contiguous areoles
..... *D. actinostomus*

1. Exciple not radially striate, sometimes marginally roughened and whitened; thallus mostly continuous.

2. Thallus saxicolous, with subtle yellowish gray tinge; spores 4-8 per ascus *D. scruposus*

2. Thallus lichenicolous, muscicolous or lignicolous, pale mineral gray; spores 4 per ascus
..... *D. muscorum*

Diploschistes actinostomus (Ach.) Zahlbr.

[DIPAC] - crustose

Occasional on exposed to lightly shaded siliceous rocks, especially sandstone on upper slopes.
[lecanoric acid]

Diploschistes muscorum (Scop.) R. Sant.

[DIPMU] - crustose

Locally frequent, usually growing over *Cladonia* squamules and mosses in extensive bedrock exposures in sandstone or igneous glades; rarely on exposed lignum. *Cladonia strepsilis* is a common substrate. [lecanoric acid]

Diploschistes scruposus (Schreb.) Norman

[DIPSC] - crustose

Infrequent, on exposed, usually massive siliceous rocks, especially large sandstone boulders in openings on upland slopes, and on sandstone in glades. [lecanoric acid]

DIRINA Fr. (Rocellaceae)

Saxicolous crustose lichens with thin, sorediate thalli, apothecia sessile (absent in our form), photobiont *Trentepohlia*, asci with thickened apex and I+ blue internal ring, with 8 hyaline, fusiform, 3-septate spores; 1 species in the region.

Dirina ? massiliensis Durieu & Mont. f. **sorediata** (Müll. Arg.) Taylor

[DIRMA] - crustose

Known only from a single collection from Oregon County, growing on sandstone. This species has a thin, grayish or greenish crust, with small, pale, punctiform, soralia. The thallus reacts C+ red. Richard Harris (pers. comm.) has indicated that local material has a much thinner thallus than that of European material. [erythrin]

DIRINARIA (Tuck.) Clem. (Physciaceae)

Small, narrow-lobed foliose lichens with a pale gray, K+ yellow upper cortex and a dark lower surface, rhizines lacking, apothecia lacking in our species; photobiont *Trebouxia*; 1 species in the region. Reference: Awasthi (1975).

Dirinaria frostii (Tuck.) Hale & W. L. Culb.

[DIRFR] - foliose

Restricted to exposed or lightly shaded, massive siliceous rock formations, in areas sheltered from direct rainfall and runoff, such as under overhanging ledges. The thalli of this species are tightly adnate, with nearly confluent lobes. [atranorin, divaricatic acid]

ENDOCARPON Hedw. (Verrucariaceae)

Small brown areolate to squamulose lichens with immersed perithecia, photobiont *Stichococcus*, the photobiont present in the hymenium, asci thick-walled, *Verrucaria* type, with 2 hyaline to brownish, muriform spores; 1 species in the region.

Endocarpus pusillum Hedw.

[ENDPU] - crustose

Occasional on shaded, often mossy dolomite in woodlands, and less commonly on shaded tree bases. This species also occurs on carbonate substrates in more exposed sites, including dolomite in glades, and even on old concrete and limestone paving blocks. *Caloplaca feracissima* is a frequent associate in disturbed areas.

FELLHANERA Vězda (Pilcarpaceae)

Saxicolous crustose lichens with thin, dark greenish gray thalli, apothecia black, thalline margin absent, photobiont chlorococcoid, asci with I+ blue apical ring structure, with 8 hyaline, short-fusiform, 4-celled spores; 1 species in the region.

Fellhanera silicis R. C. Harris & Ladd *ined.*

[FELSI] - crustose

Frequent on lightly shaded siliceous rocks in wooded uplands, usually growing on small cobbles and fragments. In the field, this species appears identical to *Micarea erratica*, which has simple ascospores. *Bacidia granosa* is also similar, but is usually restricted to carbonate rocks.

FLAVOPARMELIA Hale (Parmeliaceae)

Broad lobed, yellow-green foliose lichens with a dark, rhizinate lower cortex, apothecia rare in diasporous taxa, sessile, with a thalline margin, photobiont *Trebouxia*, asci *Lecanora*-type, with 8 simple, hyaline, ellipsoid spores; 2 species in the region.

1. Thallus sorediate or isidiate, widespread on rocks and trees; apothecia extremely rare.
 2. Thallus with farinose soredia in diffuse patches, particularly at the lobe tips; mostly corticolous *F. caperata*
 2. Thallus with coarse pustular isidia, these sometimes appearing apically sorediate, but the soredia then confined to discrete pustules with corticate bases; saxicolous or rarely on shaded tree bases *F. baltimorensis*
1. Thallus without diaspores, confined to old growth *Juniperus* in natural areas; apothecia frequent; [*F. rutidota*]

Flavoparmelia baltimorensis (Gyeln. & Foriss.) Hale [FLABA] - foliose
 Abundant on lightly to moderately shaded siliceous rocks in woodlands, growing on sandstone, chert, rhyolite, and granite. In lightly shaded sites, this species occurs with lichens such as *Myelochroa obsessa* and *Pertusaria plittiana*, while in deeper shade associates include *Myelochroa aurulenta* and *Phaeophyscia adiantola*. *Flavoparmelia baltimorensis* also occurs on shaded tree bases, usually in areas where saxicolous populations of the lichen are abundant. [atranorin, protocetraric & usnic acids, ± gyrophoric acid]

Flavoparmelia caperata (L.) Hale [FLACA] - foliose
 Abundant on shaded trees in uplands, occurring from lower boles to older canopy branches. This species also occurs on well drained decorticate logs and rarely on shaded siliceous rocks. Smaller thalli of this species are often esorediate. [atranorin, protocetraric & usnic acids]

[**Flavoparmelia rutidota** Hook. f. & Taylor) Hale [FLARU] - foliose
 A rare lichen of southwestern affinities — known from a few sites bordering Lower Ozarks, where it is restricted to populations of old growth *Juniperus virginiana* in natural areas, usually associated with massive bluff exposures, where it occurs on older, sometimes decorticate branches in areas of high light intensity. [atranorin, protocetraric & usnic acids]

FUSCIDEA V. Wirth & Vězda (Fuscideaceae)

Crustose lichens, apothecia sessile to partially immersed, photobiont chlorococcoid, asci with internal and external H⁺ blue caps, with 8 hyaline, ellipsoid to elongate-reniform, simple to 1-septate spores; 2 species in the region.

1. Thallus saxicolous; apothecia black (frequently sterile) *F. recensa*
1. Thallus corticolous; apothecia brown *F. sp. #1*

Fuscidea recensa (Stirt.) Hertel, V. Wirth & Vězda [FUSRE] - crustose
 Apparently rare on massive siliceous rock outcrops; known only from Shannon County. [divaricatic acid]

Fuscidea sp. #1 [FUSSP1] - crustose
 Known only from a Richard Harris collection from Shannon County, on hardwood twigs. [unknown substance with R_f value above norstictic acid]

FUSCOPANNARIA M. Jørg (Pannariaceae)

Small dark brown to grayish brown lichens composed of imbricate, sublobate squamules with a black tomentum on the lower surface, apothecia sessile, with a thalline margin which usually disappears

towards maturity, photobiont *Nostoc*, asci with I+ blue ring-like apical structures, with 8 simple, hyaline, spores with long-attenuate, curved, pointed ends; 1 species in the region. Reference: Jørgensen (2001).

Fuscopannaria leucosticta (Tuck.) M. Jørg.

[FUSLES] - foliose

Local on mossy, massive, lightly shaded igneous rocks and dolomite in mesic areas, usually along small streams. A related rare species, *F. leucophaea* (Vahl) M. Jørg., has been reported from the northern Ozarks just north of the region; it has epruinose lobe margins and black apothecial disks, as opposed to the marginally white pruinose squamules and brown apothecial disks of *F. leucosticta*. Additionally, *F. leucosticta* has a strongly imbricate thallus, and ascospores with strongly apiculate perispores, whereas *F. leucophaea* has a plane thallus and lacks apiculate perispores.

GOMPHILLUS Essl. (Gomphillaceae)

Crustose lichens with continuous, thin, pale, shiny thalli closely conforming to the substrate, with dark, globose, minutely stipitate apothecia, hyphophores usually present, these stipitate and becoming radially stellate at the summit, photobiont chlorococcoid, asci with an I- apical dome, with 8 large, hyaline, linear, multi-septate spores; 1 species in the region. Reference: Buck (1998).

Gomphillus americanus Essl.

[GOMAM] - crustose

Local, typically growing over the moss *Leucodon julaceus* on lightly shaded boles and large, horizontal branches of *Juniperus virginiana*, as well as on shaded *Leucodon* over carbonate bedrock; less common on other bryophytes in these habitats. Typical habitats include overgrown glades, glade margins, talus slopes and bluff summits.

GRAPHIS Adans. (Graphidaceae)

Thin, pale gray to whitish corticolous crustose lichens with lirelliform, partially immersed apothecia, hymenium I-, photobiont *Trentepohlia*, asci I-, splitting apically, with 8 hyaline to pale brownish, elongate, 5+ septate spores with lenticular lumina; 1 species in the region.

Graphis scripta (L.) Ach.

[GRASC] - crustose

Abundant on shaded, smooth, hard bark on lower and mid boles of hardwoods in woodlands, growing in both mesic and dry habitats. This species is particularly common on *Acer*, *Amelanchier*, *Carya*, *Quercus coccinea*, *Q. rubra*, and *Q. velutina*. The apothecial disks are usually white pruinose and visible as pruinose slits.

GYALECTA Ach. (Gyalectaceae)

Crustose lichens with thin, continuous to minutely granular thalli, apothecia ± immersed, pale to orange or brown, photobiont *Trentepohlia*, asci lacking apical structures, I+ blue, with 8 hyaline, ellipsoid, submuriform to muriform spores; at least 2 species in the region, but taxonomy of local populations poorly understood, and probably includes additional, perhaps undescribed, taxa.

1. Apothecia pale; paraphyses lacking carotenoids *G. jenensis*

1. Apothecia orange; paraphyses with gold to orange carotenoid droplets *G. sp #1*

Gyalecta jenensis (Batsch) Zahlbr.

[GYAJE] - crustose

Uncommon on shaded, mesic dolomite, often associated with seeping outcrops in wooded ravines and lower faces of massive bluffs.

Gyalecta sp. #1

[GYASP1] - crustose

Uncommon, in habitats similar to those of *G. jenensis*, and perhaps more common in the region than *G. jenensis*.

GYALIDEOPSIS Vězda (Gomphillaceae)

Crustose lichens with thin, lustrous, continuous gray thalli and brown or black hyphophores, apothecia unknown in local material, sessile, irregularly rounded, photobiont *Trebouxia*, asci with thickened apices, I+ wine red, with (2-)8 hyaline, muriform spores; 2 species in the region.

1. Thallus corticolous; hyphophores long and acicular, >1 mm tall *G. sp. #1*

1. Thallus on moss or humus; hyphophores short and blunt, <1 mm tall *G. sp. #2*

Gyalideopsis sp. #1 [GYASP1] - crustose
Uncommon on upper canopy twigs of *Quercus* in extensive, mature woodlands.

Gyalideopsis sp. #2 [GYASP2] - crustose
Rare, but probably overlooked, on mossy humus in open rocky woodlands along the Black River in Reynolds County and the Current River in Carter County. The hyphophores are pale brown, shallowly lacerate, and folded over.

HALECANIA M. Mayrh. (Catillariaceae)

Small saxicolous crustose lichens, apothecia sessile, with a thalline margin, photobiont *Trebouxia* (?), asci *Catillaria*-type, with 8 small, hyaline, ellipsoid, 1-septate spores; 1 species in the region.

Halecania sp. #1 [HALSP1] - crustose
Known only from a Shannon County collection by William Buck, growing on rhyolite. This species has a dark, minutely subsquamulose thallus with a conspicuous black prothallus and tiny, pale to dark apothecia with an evident thalline margin.

HEPPIA Nageli (Heppiaceae)

Brown squamulose terricolous lichens with closely adnate thalli, immersed apothecia, photobiont *Scytonema*, asci IKI-, with 8 hyaline, fusiform, simple spores; 1 species in the region. Reference: Henssen (1994).

Heppia adglutinata (Kremp.) A. Massal. [HEPAD] - squamulose
Local in exposed, thin soil pockets over dolomite in glades and on bluff summits, invariably associated with cyanobacterial or algal soil crusts, and usually growing with *Placidium squamulosum* and sometimes *Psora decipiens*.

HETERODERMIA Trevis. (Physciaceae)

Narrow lobed, pale gray foliose lichens with pale, rhizinate, corticate or ecorticate lower surface, apothecia sessile, with prominent thalline rim, photobiont *Trebouxia*, asci *Lecanora*-type, with 8 brown, thick-walled, ellipsoid, 1-septate spores; 5 species in the region.

1. Thallus lacking diaspores *H. hypoleuca*

1. Thallus sorediate or isidiate.

2. Thallus with coarse laminal isidia, the isidia granular and basally constricted *H. granulifera*

2. Thallus with marginal and/or terminal, farinose soredia.

3. Lower surface prevailing yellow to orange, fibrous or cottony *H. obscurata*
3. Lower surface white to tan, appearing corticate.
 4. Medulla K+ yellow (atranorin); soralia strongly labriform and concentrated on lobe tips *H. speciosa*
 4. Medulla K+ yellow turning red (salazinic acid); soralia marginal and not strongly labriform *H. albicans*

Heterodermia albicans (Pers.) Swinscow & Krog [HETAL] - foliose
 Rare on bases and lower boles of trees, usually in the eastern parts of the Lower Ozarks. This species is more common southeast of our region in the Bootheel area of Missouri and southeastward. [atranorin, salazinic acid, zeorin]

Heterodermia granulifera (Ach.) W.L. Culb. [HETGR] - foliose
 Infrequent on lower boles and bases of trees in wooded uplands. [atranorin, salazinic acid, ± zeorin]

Heterodermia hypoleuca (Muhl.) Trevis. [HETHY] - foliose
 Occasional, although becoming locally frequent, on lower and mid boles of hardwoods and *Juniperus* in wooded uplands. This species typically grows higher on the bole than does *H. granulifera*. [atranorin, zeorin]

Heterodermia obscurata (Nyl.) Trevis. [HETOB] - foliose
 Common, although never abundant, on bases and lower boles of both hardwoods and conifers, typically in light shade. This lichen also rarely occurs on shaded rocks. Thalli are typically smaller and more bluish-gray than the thalli of the similar *H. speciosa*. [atranorin, zeorin]

Heterodermia speciosa (Wulfen) Trevis. [HETSP] - foliose
 Common tree bases and lightly shaded, often mossy, rocks; also occasional on lower boles of trees. Although this species and *H. obscurata* often grow on the same tree, *H. speciosa* consistently shows a predilection for growing lower to the ground than does *H. obscurata*. The thallus of *H. speciosa* is typically larger, and paler mineral gray than that of *H. obscurata*. [atranorin, zeorin]

HYPERPHYSICIA Müll. Arg (Physciaceae)

Small foliose lichens with tightly appressed narrow, nearly confluent lobes, upper cortex paraplectenchymatous, lower cortex indistinctly prosoplectenchymatous, true rhizines lacking, rhizine-like structures, if present, short, few, and inconspicuous, apothecia sessile, with thalline margin, photobiont *Trebouxia*, asci *Lecanora*-type, with 8 brown, ellipsoid, 1-septate, thick-walled spores; 2 species in the region.

1. Thallus without diaspores, apothecia common *H. syncolla*
1. Thallus sorediate, apothecia lacking *H. adglutinata*

Hyperphyscia adglutinata (Flörke) H. Mayrhofer & Poelt [HYPAD] - foliose
 Uncommon on exposed bark and wood, usually in disturbed areas. See comments under *Phaeophyscia insignis*.

Hyperphyscia syncolla (Tuck. ex Nyl.) Kalb [HYPSY] - foliose
 Locally common on hardwoods and *Juniperus* in floodplains and bottomlands, as well as occasionally on exposed trees in weedy areas; growing on both boles and branches, in areas of relatively high light intensity. This species has a characteristic, shiny greenish-gray thallus, with more or less confluent lobes that appear as if they have "flowed" over the substrate.

HYPOCENOMYCE M. Choisy (Biatoraceae)

Small green to brown squamulose lichens on pine lignum, with a lustrous upper cortex and dark, sessile apothecia, thalline margin lacking photobiont chlorococcoid, asci *Biatora* type, with I+ blue apical dome, with 8 simple, hyaline, ellipsoid spores; 2 species in the region.

1. Thallus sorediate, P+ red (fumarprotocetraric acid); apothecia convex, brown *H. anthracophila*

1. Thallus not sorediate, P-; apothecia flat, black *H. friesii*

Hypoce nomyce anthracophila (Nyl.) P. James & Gotth. Schneid. [HYPAN] - squamulose
Occasional on old, shaded, usually charred stumps of *Pinus echinata* in wooded uplands. This species often grows with *Cladonia* squamules, from which it can be difficult to distinguish. Squamules of *H. anthracophila* appear more evenly rounded and regular, with a thickened, almost bullate appearance, as opposed to the irregular, typically incised, flattened squamules of *Cladonia*. [fumarprotocetraric acid]

Hypoce nomyce friesii (Ach.) P. James & Gotth. Schneid. [HYPFR] - squamulose
Very rare on shaded, usually charred stumps of *Pinus echinata* in wooded uplands, sometimes associated with *H. anthracophila*, which appears similar in gross aspect.

HYPOTRACHYNA (Vain.) Hale (Parmeliaceae)

Gray foliose lichens with moderate width lobes, black lower cortex with dichotomously branched rhizines, and sessile apothecia with a thalline margin, photobiont *Trebouxia*, asci *Lecanora*-type, with 8 simple, hyaline, ellipsoid spores; 2 species in the region.

1. Thallus without diaspores; apothecia common *H. livida*

1. Thallus with coarse, pustular isidia; apothecia lacking *H. pustulifera*

Hypotrachyna livida (Taylor) Hale [HYPLI] - foliose
Common on upper boles and larger branches of acidic-barked trees in wooded uplands; very rarely on lightly shaded rocks in similar sites. This species is part of a characteristic "late successional" assemblage on older canopy branches, associated with *Buellia stillingiana*, *Myelochroa galbina*, *Usnea strigosa*, and *Vulpicida viridis*. Young specimens are often difficult to distinguish from *Myelochroa galbina*, which is a common associate. *Hypotrachyna livida* has sparsely branched rhizines and a K+ lavender medullary reaction, while *M. galbina* has unbranched rhizines (sometimes with furcate tips) and a K+ reddish medullary reaction. [atranorin, lividic & 4-O-methylphysodic acids]

Hypotrachyna pustulifera (Hale) Skorepa [HYPPU] - foliose
Local and essentially restricted to lightly shaded boles of *Pinus echinata* in wooded uplands. [atranorin, lividic acid, (?) 4-O-methylphysodic acid]

IMSHAUGIA S. L. F. Mey. (Parmeliaceae)

Small, pale gray, isidiate, narrow-lobed foliose lichens with K+ deep yellow upper cortex and pale, rhizinate lower cortex, apothecia sessile, with thalline margin, photobiont *Trebouxia*, asci *Lecanora*-type, with 8 simple, hyaline, ellipsoid spores; 1 species in the region. Reference: Hinds (1999).

Imshaugia aleurites (Ach.) S. L. F. Mey. [IMSAL] - foliose
Rare and restricted to *Pinus echinata* and, less commonly, old growth *Juniperus virginiana*, in exposed to very lightly shaded sites in natural areas, where it grows on boles, stumps, and decorticate logs and branches of the substrate trees. [atranorin, thamnolic acid]

IONASPIS Th. Fr. (Hymeneliaceae)

Saxicolous crustose lichens with thin, rimose to areolate thalli and immersed, pale to pinkish apothecia, paraphyses moniliiform, photobiont *Trebouxia*, asci *Aspicilia* type, with I- apical dome, with 8 small, simple, hyaline, ellipsoid spores; 2 species in the region. Reference: Lutzoni (1994).

1. Thallus greenish gray to gray; apothecia pale, to 0.2 (0.4) mm broad; on shaded, siliceous rocks in uplands
..... *I. alba*

1. Thallus pale to pinkish or tan; apothecia pale pink to orangish, typically 0.3-0.5 mm broad; on moist or seepy siliceous rock faces *I. lacustris*

Ionaspis alba Lutzoni

[IONAL] - crustose

Rare or overlooked; on lightly shaded siliceous rocks, including small rock fragments, in wooded uplands.

Ionaspis lacustris (With.) Lutzoni

[IONLA] - crustose

Known only from a seeping face on the lower portion of a massive rhyolite bluff in an igneous canyon system in Shannon County.

JULELLA Fabre (Arthopyrenaceae)

Crustose fungi with continuous, whitish gray thalli and abundant, small, black, subimmersed perithecia, photobiont absent, asci with apically thickened inner wall and shallow ocular chamber, with 8 hyaline, muriform spores, each with a gelatinous perispore; 1 species in the region. Reference: Harris (1973).

Julella fallaciosa (A. Massal.) Coppins

[JULFA] - crustose

Occasional on a variety of hardwoods, usually growing on shaded lower and mid boles in wooded uplands. This species lacks any photobiont, whereas both *Anisomeridium* and *Strigula* have *Trentepohlia*.

LECANIA A. Massal. (Lecanoraceae)

Saxicolous crustose lichens with thin greenish to olive thalli, apothecia sessile with thalline margins, photobiont *Trebouxia*, asci *Bacidia*-type, with 8 hyaline, ellipsoid, 1-septate spores; 2 species in the region.

1. On carbonate substrates in mesic areas; thallus areolate to subsquamulose *L. perproxima*

1. On igneous rocks near water line in clear, fast-flowing streams; thallus continuous to rimose
..... *L. rheophila*

Lecania perproxima (Nyl.) Zahlbr.

[LECPE] - crustose

Uncommon on mesic, shaded, carbonate substrates, such as mossy moist dolomite outcrops along small streams in ravines.

Lecania rheophila R.C. Harris & Ladd *ined.*

[LECRH] - crustose

Restricted to water line of igneous rocks in small, clear, fast-flowing streams, or temporary water courses in ravines, generally found in intact habitats. This species does not occur in sites where flood amplitudes, flow dynamics, or water turbidity and quality have been significantly altered by anthropogenic activity in the watershed.

LECANORA Ach. (Lecanoraceae)

Crustose lichens with powdery, granular, continuous, areolate, or placodioid thalli, apothecia sessile, mostly with a well-developed thalline margin, photobiont *Trebouxia*, asci *Lecanora*-type, with 8 small, hyaline, ellipsoid, simple spores; 19 species in the region. Reference: Brodo (1984), Printzen (2001).

1. Saxicobus.

2. Thallus K-, atranorin absent.

3. Thallus thin and pale to gray or lacking; apothecia to 0.5 mm broad, with elevated, persistent, whitish thalline rims *L. dispersa*

3. Thallus leprose to thick and lobed at the margin, yellowish green (sometimes with dense white pruina); larger apothecia >0.6 mm broad, with thin, yellowish green rims disappearing at maturity.

4. Thallus leprose, diffuse *L. sp. # 1*

4. Thallus corticate above, placodioid to subfoliose, distinctly lobate.

5. Thallus without pruina, usually on siliceous rocks; zeorin (or other triterpenoids) present *L. muralis*

5. Thallus mostly covered with dense white pruina, on carbonate-rich substrates; zeorin and triterpenoids absent *L. valesiaca*

2. Thallus K+ yellow, atranorin present.

6. Thallus thick, areolate, pale gray; apothecia black, immersed; epithecium blue-green *L. oreinoides*

6. Thallus relatively thin, continuous to rimose; apothecia brown; epithecium brownish.

7. Epithecium P+ orange (pannarin present), hymenium shallowly inspersed with coarse granules *L. cinereofusca* var. *appalachensis*

7. Epithecium P- (pannarin absent), hymenium various.

8. Hymenium inspersed; only atranorin present *L. cenisia*

8. Hymenium not inspersed; atranorin and other substances present.

9. Thallus thick, areolate to sublobate; zeorin absent; rare *L. pseudistera*

9. Thallus thin, continuous; zeorin present; frequent *L. subimmersa*

1. Corticolous or lignicolous.

10. Thallus green, leprose, with a conspicuous fibrous white prothallus *L. thysanophora*

10. Thallus gray to yellow-green or indistinct, lacking a conspicuous white prothallus.

11. Thallus K- (atranorin absent); usnic or isousnic acid sometimes present.

12. Apothecial margins ecorticate and appearing soredate; apothecia pale tan; thallus well-developed, yellow-green; usnic acid present, isousnic acid absent *L. strobilina*

12. Apothecial margins not soredate; apothecia brown, thallus pale or brownish, without yellowish green tints, usnic acid absent, isousnic acid present or absent.

13. On bark or cones of *Pinus echinata*; isousnic acid absent *L. minutella*

13. On lignum and weathered boards; isousnic acid present *L. saligna*

11. Thallus K+ yellow or red (atranorin present, sometimes with norstictic acid); usnic and isousnic acids absent.

14. Thallus K+ yellow turning red, norstictic acid present; disks pruinose *L. caesiurubella* ssp. *prolifera*

14. Thallus K+ yellow, norstictic acid absent; disks not pruinose.

15. Soredate; sterile *L. impudens*

15. Without diaspores; fertile.

16. Upper portion of hymenium finely granular inspersed between the paraphyses *L. hybocarpa*

16. Hymenium not inspersed.

17. Margins of apothecia thick, white, ecorticate, and \pm byssoid; zeorin present
..... *L. imshaugii*

17. Margins of apothecia thin and corticate; zeorin absent (triterpenoids sometimes present).

18. Apothecia mostly <0.8 mm broad; amphithecium with clumps of large, irregular crystals *L. argentata*

18. Apothecia mostly >1 mm broad; amphithecium with small angular crystals *L. allophana*

***Lecanora allophana* Nyl.**

[LECAL] - crustose

Known only from one collection made by William Buck on hardwoods in Oregon County. [atranorin, \pm triterpenoids]

***Lecanora argentata* (Ach.) Malm**

[LECAR] - crustose

Known only from Oregon County, growing on hardwoods. [atranorin, \pm californin]

***Lecanora caesiorubella* Ach. ssp. *prolifera* (Fink) R. C. Harris**

[LECCAPR] - crustose

Frequent on lightly shaded boles and branches of hardwoods in extensive woodlands; usually growing on smooth bark in somewhat mesic habitats. Most local records are from *Acer rubrum*, *Amelanchier arborea*, *Quercus coccinea*, and *Q. velutina*. [atranorin, norstictic & protocetraric acids]

***Lecanora cenisia* Ach.**

[LECCE] - crustose

Rare on lightly shaded, massive siliceous rocks, usually in well-drained or protected sites. [atranorin]

***Lecanora cinereofusca* H. Magn. var. *appalachensis* Brodo**

[LECCIAP] - crustose

Apparently rare; on shaded siliceous rocks, usually sandstone; sometimes growing on massive bluff faces. [atranorin, pannarin, rocellic acid]

***Lecanora dispersa* (Pers.) Sommerf.**

[LECDI] - crustose

Common and weedy, often growing in disturbed areas. The characteristic habitat for this species is on calcareous substrates in exposed to lightly shaded sites. It grows on limestone, concrete, and mortar. On concrete, *Caloplaca feracissima* is a nearly constant associate, and *Endocarpon pusillum* is a common associate.

***Lecanora hybocarpa* (Tuck.) Brodo**

[LECHY] - crustose

Abundant on a variety of shaded hardwoods in woodlands, usually on the lower and mid boles, but ranging into the canopy. This species is extremely variable in the degree of thallus development, color, and size, and grows in wet to dry habitats. [atranorin, \pm rocellic acid]

***Lecanora impudens* Degl.**

[LECIMP] - crustose

Known from the base of a *Quercus alba* in a wooded upland in Shannon County. [atranorin]

***Lecanora imshaugii* Brodo**

[LECIMS] - crustose

Uncommon, on shaded hardwood boles and branches in mesic habitats, especially narrow, mesic, wooded ravines. [atranorin, zeorin, \pm hypoprotocetraric acid, \pm 4-O-methylnotatic acid]

***Lecanora minutella* Nyl.**

[LECMII] - crustose

Occasional on lightly shaded boles and older cones of *Pinus echinata* in wooded uplands; *Amandinea punctata* and *Lecanora strobilina* are consistent associates.

***Lecanora muralis* (Schreb.) Rabenh.**

[LECMU] - crustose

Common in exposed sites, usually growing on siliceous rocks, but often in areas where substrate acidity is buffered by leaching or splashing from carbonate rocks, such as on chert and sandstone

fragments in dolomite glades. More rarely, it occurs on arenaceous dolomite in similar habitats, and even more rarely, it occurs on weathered decorticate wood lying on glades. This species is similar to *L. valesiaca*, but lacks the whitish pruina that nearly obscures the thallus of *L. valesiaca*. Although *L. muralis* reportedly contains psoromic and usnic acids and sometimes fumarprotocetraric acid, all local material examined contains usnic acid, atranorin and zeorin. West of our region in the western Missouri Ozarks, one can find morphologically identical material containing usnic and gyrophoric acids and triterpenoids, as well as the typical chemotype found in the Lower Ozarks. [atranorin, usnic acid, zeorin]

***Lecanora oreinoides* (Körb.) Hertel & Rambold** [LECOR] - crustose
Locally frequent on massive exposures of siliceous rocks, growing on both sandstone and igneous substrates, typically in glades. In the field, this species is morphologically similar to *Buellia spuria*. [atranorin, confluent acid]

***Lecanora pseudistera* Nyl.** [LECPS] - crustose
Rare on exposed to lightly shaded siliceous rocks in uplands north and west of the region. [atranorin, 2'-O-methylperlatolic acid]

***Lecanora saligna* (Schrader) Zahlbr.** [LECSA] - crustose
Occasional on decorticate wood just north of the area, and likely to be found in the region. This species grows on logs, stumps, timbers, and even old railroad ties. The inconspicuous thalli are overlooked, especially when dry. Note that this species concept as applied by Purvis *et al.* (1992) contains only atranorin. [isousnic acid]

***Lecanora strobilina* (Spreng) Keiffer** [LECST] - crustose
Abundant on trees, well-drained logs, and old wood in moderate to high light intensities. This species is one of the first pioneer species to colonize young canopy branches and small saplings and shrubs invading old clearings. *Lecanora strobilina* also grows on lower boles of older trees if there is sufficient light intensity. It also occurs on decorticate logs, and scales of two year old *Pinus echinata* cones, in the latter habitat invariably associated with *Amandinea punctata*. *Lecanora strobilina* rarely occurs on lightly shaded siliceous rocks. [usnic acid, \pm zeorin]

***Lecanora subimmergens* Vain.** [LECSU] - crustose
Locally frequent on shaded sandstone and less commonly, chert boulders, often in mesic sites. This is the most common saxicolous *Lecanora* in the region. [atranorin, zeorin]

***Lecanora thysanophora* R.C. Harris in R.C. Harris, Brodo & Tønsberg** [LECTH] - crustose
Occasional on shaded, usually circumneutral bark of tree boles in mesic woodlands, growing on a variety of hardwoods. The thin, yellowish green, leprose thallus with a conspicuous fibrous white prothallus is distinctive. [atranorin, usnic acid, zeorin, \pm porphylic acid]

***Lecanora valesiaca* (Müll. Arg.) Stizenb.** [LECVA] - crustose
Common on exposed, massive carbonate rocks, typically in glades and on bluffs, where it occurs on both limestone and dolomite, typically associated with bright orange apothecia of *Caloplaca*. The densely white-pruinose thallus is distinctive. [usnic acid, \pm roccellic acid]

***Lecanora* sp. # 1** [LECSP1] - crustose
Infrequent on sheltered areas of massive sandstone exposures exposed to high light intensities. In the field this species looks like a species of *Lepraria*. [usnic acid, unknown substance with R_f classes of 4-5/5-6/5]

LECIDEA Ach. s. lat. (Lecideaceae)

Crustose lichens with thin to areolate-squamulose thalli, apothecia sessile, thalline margin absent, photobiont *Trebouxia*, asci, with 8 hyaline, ellipsoid, simple spores; 2 species in the region. This

group is taxonomically problematical; note that none of the Ozark species belong to *Lecidea sensu stricto*.

1. Thallus corticolous or lignicolous.

2. Lignicolous; apothecia strongly convex usually >0.5 mm broad; UV- *L. plebeja*

2. Corticolous; apothecia flat, to 0.4 mm broad; UV+ pinkish (xanthoness) *L. varians*

1. Thallus saxicolous.

3. Thallus brown or grayish brown, thin and scurfy; apothecia black; on siliceous rocks . . . *L. cyrtidia*

3. Thallus of thick brown areoles; apothecia brown; on carbonate rocks [*L. lurida*]

Lecidea cyrtidia Tuck.

[LECCY] - crustose

Occasional on exposed to lightly shaded siliceous rocks, typically growing on small fragments and boulders. This species resembles *Micarea erratica*, which typically has a darker, greenish gray thallus and bluish green epithecium, whereas *L. cyrtidia* has a brownish to grayish thallus and pale brownish epithecium.

[Lecidea lurida (Ach.) DC.]

[LECLU] - crustose

This small, areolate-squamulose lichen grows on weathered, exposed dolomite in portions of the Ozarks just north and west of the region, and probably occurs in the area. Typical habitats include glades and upper portions of massive bluffs.

Lecidea plebeja Nyl.

[LECPL] - crustose

Occasional on sound decorticate logs in shaded uplands.

Lecidea varians Ach.

[PYRVA] - crustose

Very common on exposed twigs and branches in exposed to lightly shaded sites, including the canopy level of trees in mature woodlands, as well as on smaller trees and lower branches in clearings and along woodland edges. This species is one of the first pioneer lichens to inhabit exposed young branches in woodlands, growing with *Amandinea polyspora*, *Arthonia caesia*, and *Lecanora strobilina*. This species was formerly called *Pyrrhospora varians* (Ach.) R. C. Harris, but Hafellner (1993) noted that it does not have the characters of that genus without suggesting where it should be assigned; Harris (1995) suggests interim replacement in *Lecidea*, although a new segregate genus may be a more appropriate final disposition. [xanthone]

LECIDELLA Körb. (Lecanoraceae)

Crustose lichens with thin gray thalli and sessile black apothecia, thalline margin absent, photobiont unicellular, *Chlorella*-like, asci *Lecanora*-type, with 8 hyaline, simple, ellipsoid spores; 1 species in the region, but in the Midwest this genus is poorly understood, and several other taxa occur in the region, at least 2 of which (one corticolous and one saxicolous) occur in the Lower Ozarks.

Lecidella enterolucella (Nyl.) Hertel

[LECEN] - crustose

Rare, or possibly overlooked, on exposed to lightly shaded siliceous rocks. This species has a pale gray, continuous-areolate thallus with small (ca. 0.2 mm) black apothecia. *Lecidella elaeochroma* (Ach.) Hazsl. is known from the bole of a *Quercus velutina* in a wooded upland just north of the region; in gross aspect it might be confused with *Buellia stillingiana*, but the blue-green epithecium and hyaline, simple spores of the *Lecidella* distinguish the two taxa. [xanthone, zeorin]

LEPRARIA Ach. (Lecanorales: no family)

Sterile, powdery or granular undifferentiated crusts consisting of granules of fungal hyphae and *Trebouxia* or *Stichococcus*; a poorly understood genus with at least 6 species in the region. For

convenience, some morphologically similar species are included in the key. Reference: Laundon (1992).

1. Thallus diffuse, dark gray-green, containing terpenes only; on shaded, sheltered carbonate rocks *L. lesdainii*
1. Thallus thick and compact to diffuse, bluish, whitish, gray, or green, containing other lichen substances but not terpenes other than zeorin; substrates various.
 2. Thallus containing atranorin, K+ yellow.
 3. Thallus P+ red, containing fumarprotocetraric acid *L. cf. caesioalba*
 3. Thallus P- or P+ yellow to orangish, fumarprotocetraric acid lacking.
 4. Stictic acid present, thallus P+ orangish, thick, pale greenish gray *L. lobificans*
 4. Stictic acid lacking, thallus P+ yellow, thin, pale gray or blue-gray.
 5. Thallus diffuse, bluish gray; well-developed prothallus lacking; usnic acid absent *L. sp. # 1*
 5. Thallus compact and distinct, yellowish green; with well developed fibrous white prothallus; usnic acid present *Lecanora thysanophora*
 2. Thallus without atranorin, K-.
 6. Thallus saxicolous, KC+ red, containing alectorialic acid *L. neglecta*
 6. Thallus corticolous, C-, containing usnic acid and zeorin sterile *Lecanora strobilina*?

Lepraria cf. caesioalba (de Lesd.) J. R. Laundon [LEPCA] - crustose
Frequent on massive siliceous rock exposures in full sun to very light shade, often growing on vertical faces of bluffs and rock exposures in glades. In well-developed individuals, the thallus appears dense and lobate when viewed from a distance, creating the appearance of a gray foliose lichen. Local populations do not closely resemble typical material, and may represent a new species. *Lepraria nivalis* J.R. Laundon occurs at several localities just outside of the Lower Ozark region — it has protocetraric acid instead of fumarprotocetraric acid, and seems to prefer vertical siliceous substrates in more mesic sites, such as along streams. [atranorin, fumarprotocetraric acid]

Lepraria lesdainii (Hue) R. C. Harris [LEPLE] - crustose
Occasional on sheltered, deeply shaded, often mossy, carbonate rocks, usually in mesic sites. This species is easily identified by its diffuse thallus, habitat, and characteristic dark gray green color resembling *Penicillium* mold on bread. The only other leprose lichen that grows on shaded carbonate rocks, *L. lobificans*, has a thick, better developed, much lighter greenish gray thallus, usually with areas of white. This species is sometimes placed in the genus *Botryolepraria*, as *B. lesdainii* (Hue) Canals, Hernández-M., Gómez-B. & Llimona. [terpene with R_f value just above zeorin]

Lepraria lobificans Nyl. [LEPLO] - crustose
Very common in shaded, somewhat sheltered, sites; on tree bases, carbonate rocks, siliceous rocks, and even on stable, sheltered soil faces along streams. The thick, felty thallus is distinctive. This species and *L. lesdainii* are the most shade tolerant leprose lichens in the local flora. Both species typically occur in shade levels unsuitable for most other lichens. [atranorin, stictic acid, zeorin]

Lepraria neglecta (Nyl.) Erichsen [LEPNE] - crustose
Locally frequent on exposed siliceous rocks in glades and on bluffs. This species resembles *L. caesioalba*, but tends to occur in more exposed sites. The thallus of *L. neglecta* is KC+ red, while that of *L. caesioalba* is KC-. [alectorialic acid]

Lepraria sp. #1 [LEPSP1] - crustose
Very common throughout the region, occurring on shaded lower boles and bases of both hardwoods and softwoods. All known local populations are corticolous, although elsewhere in the lower Midwest this species is rarely saxicolous. This species has a distinctive, powdery, thin, pale blue-gray thallus. [atranorin, zeorin]

LEPROLOMA Nyl. ex Crombie (Pannariaceae)

Sterile, granular undifferentiated crusts resembling *Lepraria*, photobiont chlorococcoid, local populations are always sterile; 1 species in the region.

Leptroloma vouauxii (Hue) J.R. Laundon

[LEPVO] - crustose

Local in sheltered, high light intensity sites on massive siliceous rock exposures, especially sandstone. This species usually occurs in association with glades. The thallus is unevenly suffused with grayish yellow, and consists of aggregations of leprose granules averaging 0.1-0.3 mm in diameter. This species produces a distinctive K+ grape purple reaction, although in Great Britain Purvis *et al.* (1992) consider this taxon to be K-. [unknown K+ deep purple compound with R_f class of 1/2/1, possibly 6-methylpannaric acid or 6-methyloxypannaric acid]

LEPTOGIUM (Ach.) Gray (Collemataceae)

Gelatinous lichens with a ± lustrous, lead gray to brown thallus, cellular upper cortex, and sessile, laminal apothecia with thalline margins, photobiont *Nostoc*, asci with apical dome staining I+ pale, with an I+ dark blue axial tube, with 8 hyaline septate or submuriform to muriform spores; 7 species in the region. Reference: Sierk (1964).

1. Thallus densely white tomentose beneath *L. burnetiae*

1. Thallus not tomentose.

2. Thallus not isidiate.

3. Lobes linear, the larger apothecia usually broader than the lobes on which they are located; on massive carbonate rock escarpments [*L. apalachense*]

3. Lobes rotund, prevailing broader than the apothecia; on mossy rocks and tree bases
. *L. juniperinum*

2. Thallus isidiate.

4. Upper cortex with distinct longitudinal wrinkles or ridges.

5. Thallus lead gray, ± flattened, with fine, low wrinkles *L. austroamericanum*

5. Thallus brown to gray-brown, often irregularly convolute or with upturned lobe tips, with coarse ridge-like wrinkles.

6. Thallus with fused overlapping lobes prevailing more than 1 mm broad; lobe tips entire, isidia granular, mostly laminal *L. milligranum*

6. Thallus with narrow, discrete lobes <1 mm broad; lobe tips lacerate-fringed with narrow cylindrical isidia *L. lichenoides*

4. Upper cortex essentially smooth.

7. Thallus lead gray; apothecia very rare; lobes typically >1.5 mm wide *L. cyanescens*

7. Thallus brown to dark blackish gray; apothecia frequent; lobes <1 mm wide
. *L. dactylinum*

[Leptogium apalachense (Tuck) Nyl.]

[LEPAP] - gelatinous

Local on very lightly shaded limestone and dolomite bluffs and outcrops just north and west of the region.

Leptogium austroamericanum (Malme) C. W. Dodge

[LEPAU] - gelatinous

Occasional in woodlands, on shaded tree bases and shaded, usually mossy, rocks.

Leptogium burnetiae C. W. Dodge

[LEPBU] - gelatinous

Infrequent in shaded mesic habitats with moderate light intensities, on mossy rocks, tree bases, and also on dolomite in woodlands and along borders of glades.

Leptogium cyanescens (Rabenh.) Körb. [LEPCY] - gelatinous
Common on lower boles of hardwoods and *Juniperus* in woodlands, and occasionally on mossy rocks.

Leptogium dactylinum Tuck. [LEPDA] - gelatinous
Infrequent on shaded, moist, usually mossy rocks, often along streams or in ravines. This species also occurs on the bases of trees in heavily shaded sites.

Leptogium juniperinum Tuck. [LEPJU] - gelatinous
Rare on shaded, mossy substrates, including tree bases, and both carbonate and silicious rocks.

Leptogium lichenoide s (L.) Zahlbr. [LEPLI] - gelatinous
Frequent on lightly shaded, mossy outcrops of carbonate bedrock, and rarely on shaded tree bases.

Leptogium milligranum Sierk [LEPMI] - gelatinous
Frequent on boles of hardwoods and *Juniperus* in wooded uplands and along glade margins, and rarely on lightly shaded siliceous rocks in wooded uplands.

LICHINELLA Nyl. (Lichinaceae)

Saxicolous gelatinous lichens with rounded, subimbricate to strap-like thalli, the lobes sometimes with slightly raised or thickened margins, apothecia small, immersed in the thallus, photobiont *Xanthocapsa*, asci with 8 simple, hyaline, broadly ellipsoid spores; 1 species in the region (see also discussion under *Thyrea*).

Lichinella nigritella (Lettau) Moreno & Egea [LICNI] - gelatinous
Common on massive dolomite exposures on glades, bluffs, and exposed outcrops, often occurring as scattered individual thalli.

LITHOTHELIUM Müll. Arg (Pyrenulaceae)

Inconspicuous, corticolous crustose lichens with thin, pale grayish to greenish thalli and partially immersed to immersed, black, somewhat carbonaceous perithecia, ostioles lateral or angled, photobiont *Trentepohlia*, asci fissitunicate, with 8 hyaline to brownish, somewhat fusiform, multi-septate spores; 3 species in the region.

1. Spores prevailingly 5-7-septate, >50 µm long, brown *L. macrosporum*

1. Spores 3-septate, <45 µm long, brown or hyaline.

2. Spores brown, 30-45 µm long *L. phaeosporum*

2. Spores hyaline, up to 20 µm long *L. illotum*

Lithothelium illotum (Nyl.) Aptroot [LITIL] - crustose
Uncommon on shaded lower boles of *Fraxinus americana*, usually in mesic sites such as along small streams and in ravines.

Lithothelium macrosporum (R. C. Harris) Aptroot [LITMA] - crustose
Known from a few collections from shaded lower boles of trees, growing on *Fraxinus americana* and *Quercus alba*.

Lithothelium phaeosporum (R. C. Harris) Aptroot [LITPH] - crustose

Known from a single collection from the base of a *Fraxinus americana* along a small stream. This lichen is probably overlooked and more common than existing records indicate; it is known from other sites in the Ozarks.

LOXOSPORA A. Massal. (Ophioparmaceae)

Crustose lichens with continuous, pale gray, K+ deep yellow thalli with abundant isidioid hollow pustules and prominent pale fibrous prothallus, photobiont *Trebouxia*; 1 species in the region. Reference: Brodo and Culberson (1986).

Loxospora pustulata (Brodo & W. L. Culb.) R. C. Harris [LOXPU] - crustose
Common and locally abundant in mature woodlands, growing on shaded tree boles, decorticate fallen logs, and lightly shaded siliceous rocks. This species resembles a *Pertusaria* at first glance, but the abundant pustules are diagnostic. [thamnolic acid, ± atranorin, ± elatinic acid, ± squamatic acid]

MARONEA (Ach.) A. Massal. (Fuscideaceae)

Small corticolous crustose lichens with dark green granular-areolate thalli, apothecia sessile, with black to dark brown, sometimes pruinose, disks and well-developed thalline margins, photobiont cf. *Trebouxia*, asci with an ocular chamber, with a well-developed, I+ blue apical dome, with numerous minute, hyaline, ellipsoid, simple and 1-septate spores; 1 species in the region.

Maronea polyphaea H. Magn. [MARPO] - crustose
Frequent on canopy branches and mid and upper boles of trees in woodlands, as well as on boles and branches of young trees in old clearings in woodland regions. Local populations were formerly called *M. constans* (Nyl.) Hepp, which is actually a European species that contains divaricatic acid and reacts KC- in the medulla, whereas *M. polyphaea* is KC+ red. [alectorialic acid]

MELASPILEA Nyl. (Patellariaceae)

Corticolous crustose lichens with thin whitish thalli and sessile to subimmersed, black apothecia, photobiont *Trentepohlia*, asci I-, with a thickened apex and ocular chamber, with 8 hyaline to slightly brownish, 1-septate, ellipsoid spores which are somewhat constricted at the septum; 1 species in the region.

Melaspilea arthonioides (Fée) Nyl. [MELAR] - crustose
Rare on shaded boles of trees in mesic areas, especially in sites with moderately high light intensities, such as along the margins of fens and spring branches and other areas with permanently high humidity levels and isothermal waters with a buffering effect on seasonal temperature extremes.

MICAREA Fr. (Micareaaceae)

Small crustose lichens with thin, granular or inconspicuous thalli, apothecia small, sessile, lacking a thalline margin, photobiont green, reported to be of thin-walled, often paired, cells 4-7 µm in diameter, asci with I+ blue apical dome and darker apical tube, with 8 hyaline, simple to 3-septate spores; 5 species in the region.

1. Spores 3-septate; thallus C+, KC+ reddish (gyrophoric acid) *M. peliocarpa*

1. Spores simple or 1-septate; thallus C-, KC- (no lichen substances).

2. Saxicobus.

3. Apothecia dark gray to black; hypothecium dark brown *M. erratica*

3. Apothecia pale to orange brown; hypothecium yellow to pale brown *M. lithinella*
2. Corticobus or lignicobus; hypothecium pale.
 4. Pycnidia black, often stipitate *M. misella*
 4. Pycnidia pale to grayish, sessile or immersed *M. prasina*

Micarea erratica (Körb.) Hertel, Rambold & Pietschm. [MICER] - crustose
Occasional on exposed to lightly shaded siliceous rock fragments in wooded uplands, old fields, and along stable embankments. A typical habitat is sandstone or chert fragments on sparsely vegetated ridges in wooded uplands. The thallus is usually dark gray, with abundant, small black apothecia. *Fellhanera silicis* appears identical in the field, but has 4-celled ascospores.

Micarea lithinella (Nyl.) Hedl. [MICLI] - crustose
Known only from chert fragments in an open wooded upland in Shannon County, associated with *Lecidea cyrtidia*. This cryptically colored, diminutive lichen is easily overlooked and probably more common in the region than the single known collection would indicate.

Micarea misella (Nyl.) Hedl. [MICMI] - crustose
Known only from decorticate hardwood logs on Stegall Mountain in Carter County.

Micarea peliocarpa (Anzi) Coppins & R. Sant. [MICPE] - crustose
Occasional, and easily overlooked, on rocks and logs in shaded sites. The apothecia range from black to nearly pure white in deeply shaded habitats. [gyrophoric acid (sometimes only in trace amounts)]

Micarea prasina Fr. [MICPR] - crustose
Occasional, typically growing on exposed to lightly shaded logs, fallen branches, and stumps.

MYCOCALICIUM Vain. (Mycocaliciaceae)

Crustose nonlichenized fungi with no apparent thallus, or with an indistinct lightened zone on bark or wood, with dark, stipitate apothecia, photobiont absent, asci two-walled, with an ocular chamber, I-, with 8 brownish to greenish, ellipsoid, simple ascospores, asci disintegrating after spores have matured, but not forming a mazaeidum; 3 species in the region. Reference: Tibell (1975, 1996).

1. Ascomata with notably incurved margin; outer surface of excipulum with thin layer of greenish yellow pruina *M. calicioides*
1. Ascomata margins not incurved; excipulum not pruinose.
 2. Tissue at base of excipulum with thin-walled, ± isodiametric cells 8-13 µm diameter *M. albonigrum*
 2. Tissue at base of excipulum with thick-walled, cylindrical to isodiametric cells 4-6 µm diameter.
 3. Capitulum K+ reddish; on *Juniperus* or rarely *Pinus* *M. ozarkanum*
 3. Capitulum K-; on hardwoods or *Pinus* *M. subtile*

Mycocalicium albonigrum (Nyl.) Fink [MYCAL] - crustose
Infrequent on bark and lignum of hardwoods; particularly associated with standing decorticate *Quercus* snags in wooded uplands.

Mycocalicium calicioides (Nadv.) Tibell [MYCCA] - crustose
Apparently rare; known from weathered, old, decorticate wood of *Juniperus virginiana* on a massive dolomite bluff along the Eleven Point River.

Mycocalicium ozarkanum R.C. Harris & Ladd *ined.* [MYCOZ] - crustose
Occasional on weathered wood of *Juniperus virginiana* in exposed to lightly shaded sites; also known from a single occurrence on wood of *Pinus echinata*.

Mycocalicium subtile (Pers.) Szat.

[MYCSU] - crustose

Frequent on weathered, well-drained, decorticate logs and standing decorticate snags, growing on sound wood. This species typically occurs in wooded uplands.

MYCOGLAENA Höhn. (Micropeltidaceae)

Corticolous crustose nonlichenized fungi with thin, pale, silvery thalli and perithecium-like ascomata with blue-green walls, photobiont absent, asci with truncated apex, with 8 ellipsoid to subfusiform, hyaline, 3-septate to submuriform spores; 2 species in the region. Although not lichenized, these taxa resemble lichens and have traditionally been treated in lichen floras. Reference: Harris (1973).

1. Spores submuriform, with some cells longitudinally divided; on a variety of hardwoods *M. meridionalis*

1. Spores 3-5-septate, without longitudinal septations, or rarely with a single cell longitudinally divided; on *Quercus* *M. quercicola*

Mycoglaena meridionalis (Zahlbr.) Szatala

[MYCME] - crustose

Occasional on small, smooth-barked twigs in high light intensities, typically on exposed branch tips of both larger trees and young trees and shrubs in old fields and along woodland edges. This species is more common in the rangelands and agricultural regions of Missouri and Arkansas. At first glance, the continuous, thin, silvery thallus of this species resembles *Arthonia punctiformis*, but the ascomata of *Mycoglaena* are larger and more regular.

Mycoglaena quercicola R. C. Harris

[MYCQU] - crustose

Occasional on young, smooth, canopy twigs of *Quercus*, growing on *Q. coccinea*, *Q. marilandica*, *Q. rubra*, and *Q. velutina*.

MYCOPORUM Flot. ex Nyl. (Mycoporaceae)

Corticolous crustose fungi with thin, brownish gray, continuous thalli, with sessile to partially immersed, rounded, dark ascomata, each containing several perithecia-like locules with separate ostioles, photobiont absent, asci subglobose, I-, with 8 brownish, ellipsoid, muriform spores; 1 species in the region.

Mycoporum pycnocarpoides Müll. Arg.

[MYCPY] - crustose

Occasional on lightly shaded tree boles in extensive woodlands, usually on upland slopes. *Quercus coccinea* is a preferred substrate.

MYELOCHROA (Asahina) Elix & Hale (Parmeliaceae)

Light gray foliose lichens with small to medium lobes and a dark lower cortex with simple to squarrosely branched rhizines; medullary tissue commonly pigmented pale yellow, apothecia sessile, brown, with a thalline margin, photobiont *Trebouxia*, asci *Lecanora*-type, with 8 simple, hyaline, ellipsoid spores; 3 species in the region.

1. Thallus without diaspores, apothecia common; typically on upper boles and twigs in high light intensities *M. galbina*

1. Thallus isidiate or sorediate; apothecia extremely rare in Ozark material; typically on rocks and lower portions of trees in shaded habitats.

2. Thallus sorediate, lobes 2-4 mm broad; corticolous or saxicolous *M. aurulenta*

2. Thallus isidiate, lobes <2 mm broad; saxicolous on siliceous rocks *M. obsessa*

Myelochroa aurulenta (Tuck.) Elix & Hale [MYEAU] - foliose
Common in woodlands, from the bases to the mid boles of trees, as well as on fallen logs, and lightly to moderately shaded, often mossy, rocks. Although the medulla of this species is often described as yellow, many Ozark populations have white medullary tissue which usually reacts at least weakly K+ yellow. [atranorin, terpenes, ± ertothein (yellow pigment)]

Myelochroa galbina (Ach.) Elix & Hale [MYEGA] - foliose
A common and characteristic species of canopy branches in wooded uplands, typically on red oaks (*Quercus coccinea*, *Q. falcata*, *Q. marilandica*, *Q. rubra*, *Q. velutina*), but also occurring on a wide range of hardwoods. This species is often confused with *Hypotrachyna livida*, which it closely resembles. *Myelochroa galbina* has darker, smaller, more irregular and often rugose lobes, usually pale yellow medullary tissue, at least under the apothecia, and a KOH+ yellow to reddish medullary reaction. *Hypotrachyna livida* has larger, paler, and more regular lobes, and white medullary tissue that reacts K+ lavender purplish. Rhizines of *M. galbina* are simple or apically furcate, while *H. livida* usually has some rhizines with sparse dichotomous branches. [atranorin, galbinic acid, zeorin]

Myelochroa obsessa (Ach.) Elix & Hale [MYEOB] - foliose
Occasional on lightly shaded, siliceous rocks in wooded uplands, typically occurring on sandstone in the Lower Ozarks, although occasionally on igneous substrates as well. Common associates include *Flavoparmelia baltimorensis*, *Lecanora subimergens*, *Loxospora pustulata*, and *Pertusaria plittiana*. [atranorin, galbinic acid, terpenes]

MYXOBILIMBIA Hafellner [formerly in MYCOBILIMBIA Rehm] (Biatoreaceae)

Small muscicolous crustose lichens with thin, granular thalli, apothecia sessile, thalline margin absent, photobiont chlorococcoid, asci with 8 ellipsoid to fusiform, 3-8-septate spores; 1 species in the region.

Myxobilimbia sabulætorum (Schreb.) Hafellner [MYXSA] - crustose
Occasional, usually growing over pleurocarpous mosses in sparsely vegetated areas of wooded uplands.

NADVORNIKIA Tibell (Thelotremaaceae)

Corticolous crustose lichens with thin, pale, lustrous, sorediate thalli, apothecia immersed, photobiont *Trentepohlia*, asci disintegrating into a mazaeidium, with numerous small, brown, 1-septate spores; 1 species in the region. Reference: Harris (1990).

Nadvornikia soorediata R. C. Harris [NADSO] - crustose
Uncommon on shaded boles of hardwoods, usually in mesic woodlands in ravines and along streams. The thin, lustrous thallus with punctiform soralia is distinctive. [stictic acid]

NEPHROMA Ach. (Nephromataceae)

Loosely adnate foliose lichens with lustrous, deep brown upper cortex and pale to darkening, tomentose lower cortex, upper cortex with squamiform-isidiate lobules, particularly along the margins, apothecia sessile on the underside of the lobe tips, somewhat elongated, with brown disk and thin thalline margin, photobiont *Nostoc*, asci resembling *Peltigera*-type asci, with 8 brownish, fusiform, 3-septate spores; 1 species in the region. Reference: Wetmore (1960).

Nephroma helveticum Ach. [NEPHE] - foliose
Uncommon on mesic, often mossy tree bases and rocks in natural areas, usually in well-shaded sites.

NORMANDINA Nyl. (Verrucariaceae)

Delicate, sterile lichens with small, discrete, rounded, blue-gray squamules with upturned edges, squamules typically with concentric rings and often sorediate, lower surface white tomentose, photobiont *Trebouxia*; 1 species in the region.

Normandina pulchella (Borrer) Nyl.

[NORPU] - squamulose

Rare on shaded, lichenose, often mossy boles of old growth *Juniperus virginiana* and hardwoods in high quality woodlands.

OCHROLECHIA A. Massal. (Pertusariaceae [pro tem])

Crustose species with well-developed, light gray, continuous thalli, apothecia sessile, with thalline margins and tan disks, photobiont chlorococcoid, and *Lecanora* type asci with 8 large, simple, hyaline, ovoid spores; 5 species in the region. Reference: Brodo (1991).

1. Thallus sorediate; apothecia absent *O. arborea*

1. Thallus esorediate, although sometimes isidiate; apothecia usually numerous.

2. Thallus with abundant, coarse, pustular isidia; saxicolous *O. yasudae*

2. Thallus lacking diaspores, sometimes verrucose-warty; corticolous or rarely saxicolous.

3. Cortex and medulla of thalline margin of apothecia C+ yellow or C-; on *Pinus*
. *O. pseudopallescens*

3. Cortex and/or medulla of thalline margin of apothecia C+ red to pink; on hardwoods or rarely siliceous rocks or conifers.

4. Thalline margin of apothecia with C- cortex and C+ red medulla *O. africana*

4. Thalline margin of apothecia with C+ red cortex and C- medulla *O. trochophora*

Ochrolechia africana Vain.

[OCHAF] - crustose

Frequent on a wide variety of hardwoods and occasionally on *Juniperus virginiana*, growing on lightly shaded branches as well as occasionally on tree boles. This is the most common member of the genus in the Ozark region. Some local material contains lichexanthone and fluoresces UV+ yellow, while other local material is UV-. A population from Randolph County has UV+ and UV- thalli growing mixed on the same tree. [gyrophoric acid, ± lichexanthone]

Ochrolechia arborea (Kreyer) Almb.

[OCHAR] - crustose

Occasional on lightly shaded to exposed tree branches, usually in areas with remnant natural integrity. *Juniperus virginiana* branches are the preferred substrate. This species has small, round soralia averaging about 0.5 mm wide, with finely granular soredia; in some specimens the soralia coalesce into large continuous patches of soredia. The cortex fluoresces UV+ bright yellow, as contrasted with the UV- cortex and coarse corticate pustules of *Loxospora pustulata*. *Nadvornikia sorediata* has a thinner thallus that is more pale gray without bluish overtones. [gyrophoric acid, lichexanthone]

Ochrolechia pseudopallescens Brodo

[OCHPS] - crustose

Known only from the lower bole of an old-growth *Pinus echinata* in a remnant virgin pine stand in Shannon County. [gyrophoric & variolaric acids]

Ochrolechia trochophora (Vain.) Oshio

[OCHTR] - crustose

Apparently uncommon, but perhaps overlooked because of its resemblance to *O. africana*, from which it can be readily distinguished by the C reaction of the cortex and medulla of the thalline margin of the apothecia, as discussed in the key above. Although this is typically a species of lightly shaded hardwood substrates, one local collection is from lightly shaded siliceous rocks. Local material is referable to var. *trochophora*. [gyrophoric acid]

Ochrolechia yasudae Vain.

[OCHYA] - crustose

Uncommon on exposed to lightly shaded siliceous boulders and outcrops. [gyrophoric acid]

OPEGRAPHA Ach. (Rocellaceae)

Crustose lichens with thin or obscure thalli and sessile to immersed, elongate, lirelliform apothecia, the apothecia sometimes furcate or branched, hymenium I+ orange or blue, photobiont *Trentepohlia*, asci said to have a small, I+ blue apical ring, with 8 fusiform to acicular, hyaline to brownish, 3-many septate spores; 4 species in the region.

1. Thallus saxicolous on carbonate rocks *O. mougeotii*

1. Thallus corticobous.

2. Spores 7+ septate, many >45 µm long, epithecium pale *O. viridis*

2. Spores 4-5(6)-septate, to 40 µm long, epithecium brown.

3. Apothecial disk exposed, usually pruinose; spores >5 µm wide; one half of spore often notably broader than the other half *O. varia*

3. Apothecial disk hidden, not pruinose; spores to 4.5 µm wide; spores of about the same width along their length *O. vulgata*

Opegrapha mougeotii A. Massal.

[OPEMO] - crustose

Rare on sheltered faces of massive dolomite escarpments and bluffs, usually growing on lightly shaded faces under overhangs.

Opegrapha varia Pers.

[OPEVA] - crustose

Occasional, usually occurring on boles of mature hardwoods in moderate to light shade, often in somewhat mesic habitats. This is the most common species of *Opegrapha* in the region. It can be distinguished from *Graphis scripta* by the white pruinose disk and longer apothecia of the *Graphis*. The apothecia of *O. varia* can be somewhat rounded and short, becoming almost oval.

Opegrapha viridis (Pers. ex Ach.) Behlen & Desberger

[OPEVI] - crustose

Known only from the shaded root of a large *Quercus rubra* in a mesic woodland. This species has small apothecia seldom attaining 1 mm long.

Opegrapha vulgata Ach.

[OPEVU] - crustose

Known from smooth bark, such as on *Carya texana*, in mature woodlands. The apothecia of this species are small, narrow, and delicate, and form multi-branched, stellate patterns.

PACHYPHYSIS R.C. Harris & Ladd *ined.* (Porpidiaceae)

Saxicolous crustose lichens with endolithic thalli that are not evident, except sometimes as an obscure grayish staining or narrow whitish prothallus, photobiont cf. *Trebouxia*, apothecia black, usually locally pruinose, eventually plane, subimmersed in pits in the substrate, asci *Porpidia* type, with 8 simple, hyaline, subglobose to broadly ellipsoid spores; 1 species in the region.

Pachypysis ozarkana R.C. Harris & Ladd *ined.*

[PACOS] - crustose

Occasional on exposed weathered dolomite in glades. Apothecia common, sessile, black, often initially pruinose and plane to slightly concave but becoming convex and irregular in circumference, ranging up to ca. 1 mm broad but averaging 0.5-0.8 mm in diameter, mostly scattered to solitary but sometimes aggregated in small clusters. Young apothecia have a well defined proper margin which becomes obscure in age. Epithecium olive gray to blue green; hymenium ca. 60-80 µm thick (including the epithecium), wholly or partially suffused with reddish to purplish brown, K+ violet pigment; hypothecium deep opaque reddish brown to black, sometimes appearing slightly carbonaceous;

Ascospores ovoid to broadly ellipsoid, simple, hyaline, closely packed and partially biseriate in the ascus, ca. $10.5\text{--}12 \times 7.5\text{--}9 \mu\text{m}$, with a thin perispore. This lichen has previously been reported as *Clauzadea monticola* (Ach. ex Schaer.) Hafellner & Bellem., a species with epruinose apothecia having an orange to reddish epithecium and narrower spores. The habitat and aspect of this lichen are evocative of *Sarcogyne regularis*.

PANNARIA Delise (Pannariaceae)

Brown foliose lichens with dense, tomentose hypothallus on lower surface, apothecia sessile, with thalline margins that are typically crenulate to sublobulate, photobiont *Nostoc*, asci I- internally, with 8 hyaline simple ellipsoid spores, these typically acuminate and surrounded by a thick perispore; 2 species in the region. Reference: Jørgensen (2001).

1. Thallus lobes to 0.5 mm broad, with narrow, divided tips; apothecia to 1 mm broad; medulla P- (pannarin absent) *P. subfusca*

1. Thallus lobes >0.8 mm broad, with broadly rounded tips, apothecia often >1 mm broad; medulla P+ red (pannarin) *P. lurida* ssp. *quercicola*

Pannaria lurida (Mont.) Nyl. ssp. **quercicola** P.M. Jørg. [PANLU] - foliose
Occasional on bases and lower boles of trees in extensive mature woodlands. This species is never abundant, and usually occurs as a few scattered thalli on a single tree. [pannarin]

Pannaria subfusca P.M. Jørg. [PANSU] - foliose
Known only from boles of old growth *Nyssa aquatica* in Cupola Pond, a sinkhole pond natural area in Oregon County. Local populations of this recently described species were formerly called *P. rubiginosa* (Ach.) Bory, under which name it was listed as Endangered in Missouri (MDC 1992).

PARMELIA Ach. (Parmeliaceae)

Gray foliose lichens with pale angular markings on the upper surface of the lobes and a dark lower cortex with squarrosely branched rhizines; apothecia sessile, brown, with a thalline margin, photobiont *Trebouxia*, asci *Lecanora*-type, with 8 simple, hyaline, ellipsoid spores; 1 species in the region. Reference: Hinds (1998).

Parmelia squarrosa Hale [PARSQ] - foliose
Rare, usually growing on lightly shaded boles of *Quercus*, often along streams. [atranorin, salazinic acid]

PARMELINOPSIS Elix & Hale (Parmeliaceae)

Narrow-lobed, gray, isidiate foliose lichens with ciliate lobes and a dark lower cortex with simple to sparsely furcate rhizines; apothecia sessile, brown, with a thalline margin, photobiont *Trebouxia*, asci *Lecanora*-type, with 8 simple, hyaline, ellipsoid spores; 2 species in the region.

1. Medulla C+ red (gyrophoric acid); isidia without apical cilia *P. minarum*

1. Medulla C- (gyrophoric acid absent); isidia apically ciliate *P. horrescens*

Parmelinopsis horrescens (Taylor) Elix & Hale [PARHO] - foliose
Rare; known only from a single collection on a small hardwood in Carter County. [atranorin, hiasic acid complex]

Parmelinopsis minarum (Vain.) Elix & Hale [PARMIN] - foliose

Occasional on shaded tree boles and siliceous rocks in wooded uplands. In the Lower Ozark region, this species appears to be particularly common on *Quercus velutina*, although it has also been recorded from *Amelanchier arborea*, *Acer rubrum*, *Quercus rubra*, and *Taxodium distichum*. [atranorin, gyrophoric acid]

PARMOTREMA A. Massal. (Parmeliaceae)

Broad lobed, light gray, foliose lichens with pale to dark, rhizinate lower cortex, sessile, sometimes perforate apothecia with a thalline margin, photobiont *Trebouxia*, asci *Lecanora*-type, with 8 simple, hyaline, ellipsoid spores; 10 species in the region. For convenience, species of *Rimelia* and *Canomaculina* are included in this key, since they resemble local species of *Parmotrema*.

1. Thallus without isidia or soredia.

2. Medulla K- (protocetraric acid) *P. michauxianum*

2. Medulla K+ red (norstictic or salazinic acids).

3. Lower surface with a broad white to pale margin, lobes often upturned or \pm erect; norstictic acid *P. perforatum*

3. Lower surface dark brown to black, lobes mostly adnate; salazinic acid.

4. Upper surface with a reticulate pattern of cracks or maculae; rhizines present to margins of lower cortex *Rimelia cetrata*

4. Upper cortex continuous and not patterned with reticulate cracks or maculae; lower cortex with a rhizine-free zone near the margins.

5. Thallus coriaceous, thick; lobe margins irregular, but lacking long lacinae *P. despectum*

5. Thallus membranaceous, thin; lobe margins rounded, typically with long lacinae *P. euryzacum*

1. Thallus isidiate or sorediate.

6. Thallus isidiate.

7. Medulla always K- and P-, C- or C+ pink to red.

8. Thallus yellowish green *P. madagascariaceum*

8. Thallus mineral gray.

9. Medulla C+ red (lecanoric acid); rhizines essentially uniform, absent from a zone along the margins of the lower cortex *P. tinctorum*

9. Medulla C-; rhizines of two distinct lengths, the shorter ones extending nearly to the margins of the lower cortex *Canomaculina haitiensis*

7. Medulla C-, K+ and P+ yellow or red to orange (salazinic or stictic acid).

10. Medulla K+ persistently yellow (stictic acid) *P. crinitum*

10. Medulla K+ yellow turning red.

11. Upper cortex smooth and continuous; lower cortex brown throughout, with rhizines of two distinct lengths *Canomaculina subtinctoria*

11. Upper cortex with a reticulate pattern of cracks or maculae; lower cortex brown to black at center, with rhizines essentially one length *Rimelia subisidiata*

6. Thallus sorediate.

12. Medulla K-.

13. Medulla C+ red or P+ red; rhizines essentially similar.

14. Medulla C+ red, P- (lecanoric acid) *P. austrosinense*

14. Medulla C-, P+ red (protocetraric acid) *P. gardneri*

13. Medulla C- and P-; rhizines of two distinct lengths *Canomaculina conferenda*
12. Medulla K+ red or orange (norstictic or salazinic acid).
15. Thallus lobes ± erect, with a broad white marginal zone on the lower surface; norstictic acid present, salazinic acid absent *P. hypotropum*
15. Thallus lobes adnate, lower surface black throughout; norstictic acid absent, salazinic acid present.
16. Portions of the upper cortex with reticulate pattern of cracks and/or maculae; soralia round, delimited, prevailing on short marginal lobes; lower cortex with a distinct marginal zone free of rhizines *P. margaritatum*
16. Upper cortex lacking a reticulate pattern; soralia linear and marginal to laminal and diffuse, not prevailing on short marginal lobes; rhizines usually present to margin of lower cortex *Rimelia reticulata*

Parmotrema austrosinense (Zahlbr.) Hale [PARAU] - foliose
 Uncommon on lightly shaded branches of hardwoods and especially *Juniperus virginiana*, usually occurring as individual thalli and never abundant. Although similar to the much more common *P. hypotropum* in having ± erect lobes with a broad marginal white zone beneath, *P. austrosinense* has more delicate, crisply defined, fine, linear soralia and has no cilia along the lobe margins, whereas *P. hypotropum* has coarser, more diffuse soralia and numerous black cilia along the lobe margins. [atranorin, lecanoric acid]

Parmotrema crinitum (Ach.) M. Choisy [PARCR] - foliose
 Uncommon on lightly shaded hardwood boles in open woodlands, typically growing on *Carya* and *Quercus*. [atranorin, stictic acid]

Parmotrema despectum Kurok. [PARDE] - foliose
 This species has been newly described as a segregate of *P. eurysacum* (Kurokawa 2001). It may be the more common element in the Ozark region, although further study is needed to elucidate the ecologies and abundances of each species. The complex is common on boles and larger branches of hardwoods in mature woodlands, usually in lightly shaded sites. [atranorin, salazinic acid]

Parmotrema eurysacum (Hue) Hale [PAREU] - foliose
 As discussed under *P. despectum*, this species occurs on boles and larger branches of trees in mature woodlands. It appears to be far less common locally than *P. despectum*. Both *P. eurysacum* and *P. despectum* differ from *Rimelia cetrata* in that the latter species has a reticulately cracked or maculate upper cortex and the lower cortex is rhizinate to the margin. [atranorin, salazinic acid]

Parmotrema gardneri (C. W. Dodge) Serus. [PARGA] - foliose
 Very rare; on branches and boles of hardwood trees in lightly shaded situations. [atranorin, protocetraric acid]

Parmotrema hypotropum (Nyl.) Hale [PARHYPT] - foliose
 Common on trees in woodlands, usually in relatively high light intensities. It occurs on the larger branches of canopy trees in mature woodlands, as well as on upper boles of trees and occasionally on lightly shaded siliceous rocks. This species is particularly common on *Gleditsia triacanthos*, *Juniperus virginiana*, and on the lower boles and bases of *Pinus echinata* in open wooded uplands. See comments under *P. austrosinense*. [atranorin, norstictic acid]

Parmotrema madagascariaceum (Hue) Hale [PARMAD] - foliose
 Rare and local; restricted to lightly shaded, mesic siliceous rock faces in natural areas, typically associated with *Punctelia semansiana*. Southward in the Interior Highlands this species is sometimes corticolous, but our only corticolous record is from an old growth *Nyssa aquatica* in a forested sinkhole pond in Ripley County. The gyrophoric acid is often present in low concentrations in local material and not detected by a C test, but is readily revealed by thin layer chromatography. [atranorin, gyrophoric & usnic acids]

Parmotrema margaritatum (Hue) Hale [PARMAR] - foliose
 Apparently rare, but possibly overlooked. This species grows on hardwood boles, particularly *Quercus*, in mature wooded uplands. It closely resembles the more common *Rimelia reticulata*, from which it is said to differ in lacking the reticulate cracked or maculate upper cortex of *R. reticulata*. The type specimen of *P. margaritata* however, has a somewhat reticulate-maculate upper cortex. [atranorin, salazinic acid]

Parmotrema michauxianum (Zahlbr.) Hale [PARMIC] - foliose
 Occasional to frequent, usually on upper boles and larger canopy branches of hardwood trees in extensive, mature woodlands. Although this species is difficult to distinguish in the field from *Parmotrema despectum* and *Rimelia cetrata*, it has a preference for higher light intensities and typically grows at higher levels above the ground. Additionally, the lobes of *P. michauxianum* have a tendency to be more dissected into elongate marginal segments. As shown by DePriest and Hale (1998), the correct name for this taxon is *P. submarginale* (Michx.) DePriest & B. Hale. [atranorin, prorocetraric acid]

Parmotrema perforatum (Jacq.) A. Massal. [PARPE] - foliose
 Apparently rather common in the Lower Ozarks, generally growing on larger canopy branches in mature woodlands. Sometimes the thalli of this species lack the characteristic marginal white zone on the underside, and the lower surface is brown nearly to the center. Younger branches of canopy oaks in mature wooded uplands often have numerous small thalli of a *Parmotrema* that contains norstictic acid; it is impossible to determine if these are *P. hypotropum* or *P. perforatum*. [atranorin, norstictic acid]

Parmotrema tinctorum (Delise ex Nyl.) Hale [PARTI] - foliose
 Rare, on massive siliceous rock formations, generally in light shade. This species occurs on both sandstone and igneous rocks, typically on lightly shaded, mesic bluff faces. *Usnea cf. amblyoclada* is a consistent associate. Interestingly, this species is an abundant corticolous lichen in woodlands on the Gulf coastal plain. [atranorin, lecanoric acid]

PELTIGERA Willd. (Peltigeraceae)

Brown or grayish, mostly terricolous, foliose lichens with smooth, scabrid, or tomentose upper cortex, rhizinate, ecorticate lower surface, and sessile apothecia, often terminal on ± erect thallus lobes, photobiont (in local taxa) *Nostoc*, asci *Peltigera*-type, with 8 narrow, elongate, hyaline to light brown, 3-7-septate spores; 5 species in the region. The taxonomy and ecology of local populations of *Peltigera* are not well understood, and the following treatment should be regarded as extremely provisional. References: Goffinet & Hastings (1994), Goffinet & Miadlikowska (1999).

1. Thallus without diaspores or well-developed lobules.
 2. Upper cortex smooth and somewhat lustrous *P. polydactylon*
 2. Upper cortex, especially near lobe tips, finely tomentose.
 3. Thallus uniformly thin, the lobe tips mostly turned downward; typically in mesic habitats *P. canina*
 3. Thallus thick, the lobe tips turned upward and usually slightly thicker than the rest of the thallus; typically in dry-mesic or dry habitats *P. rufescens*
1. Thallus with flattened to apically coralloid-isidioid lobules along the margins and cracks of the cortex.
 4. Upper cortex smooth throughout *P. phyllidiosa*
 4. Upper cortex finely tomentose, at least towards lobe tips *P. praetextata*

Peltigera canina (L.) Willd. [PELCA] - foliose

Apparently rare; in shaded, well-drained, often sandy soils in woodlands, usually in somewhat mesic sites, such as shaded banks along small waterways in ravines, or in mesic woodlands at the bases of bluffs. This species also occurs on rotten logs in similar habitats.

***Peltigera phyllidiosa* Goff. & Miadl.**

[PELPH] - foliose

Apparently infrequent in shaded, mesic areas, typically growing on mossy rocks adjacent to permanent water sources, such as streams and spring branches. It is known from both dolomite and sandstone. A rare species north of the Ozarks that would key here is *P. evansiana* Gyeln., which has globose-cylindrical, laminal isidia and a dull, minutely scabrid upper cortex. [tenui or in, triterpenoids, zeorin]

***Peltigera polydactylon* (Neck.) Hoffm**

[PELPO] - foliose

Uncommon; in lightly to moderately shaded, well-drained soil in woodlands, usually along small ridges, embankments, or other areas where both leaf litter and competition from vascular vegetation are reduced. This species occasionally grows in drier, more exposed sites, and on sandstone. [triterpenoids, ± tenui or in]

***Peltigera praetextata* (Flörke ex Sommerf.) Zopf**

[PELPR] - foliose

Occasional to locally frequent in well-drained soil and mossy rocks in light to moderate shade, typically growing at the heads of small embankments or on large boulders. This species also grows on mesic bluff faces if they are not too heavily shaded, occurring on dolomite, rhyolite, and sandstone. Local populations are often sparsely lobulate, sometimes with only a few lobules in one local region of the thallus, and are often mistaken for *P. rufescens*.

***Peltigera rufescens* (Weiss) Humb.**

[PELRU] - foliose

Apparently rare; on lightly shaded, often sandy, soils and mossy rocks.

PELTULA Nyl. (Peltulaceae)

Marginally sorediate, saxicolous lichens with discrete, thick, round peltate squamules, apothecia immersed, thalline margin lacking, photobiont *Anacystis* (?), asci thin-walled, 1-, with 100 or more hyaline, narrowly ellipsoid, simple spores; 1 species in the region. Reference: Wetmore (1970).

***Peltula euploca* (Ach.) Poelt**

[PELEU] - squamulose

Rare and local, on massive dolomite exposures, often in areas receiving intermittent seepage or runoff. The species in the region may actually be *P. bolanderi* (Tuck.) Wetmore, but according to Wetmore (1970), *P. bolanderi* has thin squamules no larger than 2 mm in diameter, while local material is larger, with thick squamules sometimes approaching 1 cm in diameter. *Peltula euploca* has immersed apothecia lacking a thalline margin, while *P. bolanderi* has sessile apothecia with a thalline margin; unfortunately, all local material seen to date is sterile.

PERTUSARIA DC. (Pertusariaceae)

Crustose lichens with well developed, corticate, continuous thalli and immersed, poriform to lecanorate or sorediate apothecia, in poriform-fruited species several apothecia often clustered in thalline warts, photobiont *Trebouxia*, asci *Pertusaria*-type, with 1-8 large, single or double walled, sometimes conspicuously ornamented spores; 17 species in the region. References: Dibben (1980), Ladd & Wilhelm (1998). Key adapted from Ladd & Wilhelm (1998).

1. Thallus isidiate, muscicobus *P. globularis*

1. Thallus not isidiate, rarely muscicobus

2. Fruiting bodies disciform, the warts lecanorate or sorediate; spores 0, 1, or 2, the walls single (subg. *Pionospora*).

3. Cortex UV+ yellow (lichexanthone).

4. Wart C+ red (lecanoric acid), with low, often eroded rims commonly covered by coarse white pruina *P. velata*
4. Wart C-; with thick, prominent rims not much covered by pruina . . . *P. hypothamnolica*
3. Cortex UV- or UV+ pinkish.
 5. Wart K+ yellow or C+ red.
 6. Wart C+ red, K- (lecanoric acid); spores 1 per ascus, mostly more than 175 ~~um~~ *long*
 6. Wart C-, K+ yellow (thamnolic acid); spores 0(1) or 2 per ascus, less than 175 um long *P. trachythallina*
 5. Wart both K- and C-.
 7. Wart KC+ violet (picrolichenic acid) *P. amara*
 7. Wart KC- *P. multipunctoides*
2. Fruiting bodies poriform, the warts mostly corticate; spores 2-8, the walls double (subg. *Pertusaria*).
 8. Spores prevailing 5-8, the inner wall smooth.
 9. Cortex UV+ yellow (lichexanthone) *P. paratuberculifera*
 9. Cortex UV- or UV+ pinkish to orange.
 10. Cortex, especially near the ostioles, C+ yellow (thiophaninic acid); thallus characteristically with tints of yellow, UV+ brilliant orange *P. texana*
 10. Cortex C- throughout; thallus without yellowish tints, UV- or UV+ weakly pink.
 11. Medulla K+ yellow turning red (norstictic acid); cortex UV-; warts open and appearing lecanorine, often pale or white in the center *P. propinqua*
 11. Medulla K-; cortex UV+ pinkish (unknown xanthone), though often weakly so; warts small, apically corticate *P. ostiolata*
 8. Spores 2-4, the inner wall smooth or ornamented.
 12. Cortex UV+ yellow (lichexanthone) *P. valliculata*
 12. Cortex UV- or UV+ pinkish to orange.
 13. Spores prevailing 3 or 4.
 14. Medulla K- (stictic acid absent); spores smooth; rare *P. globularis*
 14. Medulla K+ yellow (stictic acid); spores ornamented; occasional *P. tetrathalamia*
 13. Spores 2.
 15. Medulla K+ yellow turning red (norstictic acid); cortex UV-.
 16. Thallus saxicolous; many warts more than 1 mm in diameter *P. plittiana*
 16. Thallus corticolous or lignicolous; warts commonly fused, but individual warts notably less than 1 mm in diameter *P. neoscotica*
 15. Medulla K- or K+ yellow; cortex UV+ orange to pink (rarely UV-).
 17. Ostioles black, often solitary at the apex of a wart, and almost always less than 5/wart, usually > 0.2 mm across; warts prevailing < 0.6 mm in diameter; cortex C+ yellow, especially around the ostioles *P. pustulata*
 17. Ostioles brownish, usually more than 5/wart, usually < 0.12 mm across; warts prevailing > 0.6 mm in diameter; cortex C-.
 18. Spores smooth to slightly ornamented; medulla P+ orange-red (fumarprotocetraric acid) *P. subpertusa*
 18. Spores with conspicuous ornamentation; medulla P+ yellow to orange (stictic acid).

19. Inner side of inner spore wall sculpted with +/- broadly rounded ridges; lumen and spore walls usually KOH+ pale violet; warts often with broad, flat to slightly concave apices *P. macounii*

19. Outer (and sometimes also inner) side of inner spore wall finely and densely sculpted with reticulate ridges; lumen and spore walls K-; warts usually with rounded apices *P. tetralthamia*

Pertusaria amara (Ach.) Nyl. [PERAM] - crustose
Occasional in wooded uplands, although never abundant on any single tree. This species occurs on shaded lower and mid boles of deciduous trees, typically *Carya* and *Quercus*, as well as other hardwoods and junipers. Rarely it occurs on siliceous rock fragments in wooded uplands. Ozark populations have abundant small sorediate warts; in the northern United States this lichen typically has the warts fused into irregular rounded masses of soredia. [picrolichenic acid, ± protocetraric acid]

Pertusaria globularis (Ach.) Tuck. [PERGL] - crustose
Known from a single collection on mossy chert in a wooded upland. Although this species is described as isidiate, fertile material, such as the collection from the region, often has few or no isidia. [xanthone]

Pertusaria hypothamnolica Dibben [PERHY] - crustose
Frequent on lower and mid boles of trees in wooded uplands, typically on *Quercus*, *Carya*, and *Juniperus*, but occurring on a variety of other deciduous trees. Rarely in these habitats, *P. hypothamnolica* occurs on shaded siliceous rocks. Although all Ozark material examined to date is UV+ yellow, Dibben (1980) mentions that some populations lack lichexanthone and are UV-. Any such specimens locally would key to *P. amara* because of the KC+ wine reddish purple color reaction of hypothamnolic acid, but could be easily distinguished by the larger, better developed lecanorine warts not completely obscured by soredia. The thallus of *P. amara* is typically darker than the mineral gray thallus of *P. hypothamnolica*. [hypothamnolic acid, lichexanthone]

Pertusaria macounii (I. M. Lamb) Dibben [PERMA] - crustose
Uncommon on hardwoods in mature woodlands. *Pertusaria tetralthamia* sometimes has two ornamented spores per ascus, but the spores have a fine reticulate sculpting on the outside (and sometimes also the inside) of the inner wall, while the spores of *P. macounii* have sculpting of rounded grooves on the inside of the inner wall. [stictic acid, xanthoncs]

Pertusaria multipunctoides Dibben [PERMU] - crustose
Apparently rare, but possibly under-collected due to its resemblance to the more common *P. hypothamnolica*. It occurs on lightly shaded hardwoods in extensive, mature woodlands. [fumarprotocetraric acid]

Pertusaria neoscotica I. M. Lamb [PERNE] - crustose
Uncommon on mossy lignum and shaded hardwood boles in wooded uplands. [norstictic acid]

Pertusaria ostiolata Dibben [PEROS] - crustose
Frequent on the shaded boles of a variety of hardwood trees as well as *Juniperus virginiana*. This species has a predilection for more mesic microhabitats than does *P. hypothamnolica* and *P. paratuberculifera*, and often occurs on mossy tree bases and lower boles. Less frequently, it occurs on mid boles and branches of trees in woodlands. The somewhat papuliform, elongate warts are distinctive. [xanthone]

Pertusaria paratuberculifera Dibben [PERPA] - crustose
Common on lightly shaded lower and mid boles of trees in wooded uplands. This is the most common *Pertusaria* in the Lower Ozark region and occurs on a wide variety of deciduous trees, although most commonly on *Quercus stellata* and *Q. velutina*. It is superficially identical to the rarer *P. valliculata*,

which has four ornamented spores per ascus compared to the 8 smooth spores per ascus of *P. paratuberculifera*. [lichexanthone]

***Pertusaria plittiana* Erichsen**

[PERPL] - crustose

Locally frequent on massive, shaded sandstone and igneous rocks in uplands, typically forming large colonies. This is the only regularly saxicolous *Pertusaria* in the Interior Highlands, although other species in the genus rarely grow on rocks. Throughout the Ozarks, small dark green thalli of *Buellia vernicoma* frequently grow on or adjacent to *P. plittiana* in the region. Another saxicolous species containing norstictic acid, *Phlyctis argenta*, differs in its smoother, thick, pale gray thallus and frequent sorediate patches; it is usually sterile whereas *P. plittiana* is invariably fertile. [norstictic, perlatolic, & stenosporic acids]

***Pertusaria propinqua* Müll. Arg.**

[PERPR] - crustose

Occasional on open grown trees in moderate to high light intensities, growing on both boles and branches. This species often grows in the canopy, and seems to be less shade tolerant than many other species of *Pertusaria*. The thick-rimmed expanded warts appear almost lecanorine, [norstictic acid]

***Pertusaria pustulata* (Ach.) Duby**

[PERPUS] - crustose

Frequent on exposed small twigs and upper branches of canopy trees in woodlands throughout the region. It also occurs on lightly shaded tree boles, particularly smooth barked trees such as *Carya ovata*. *Pertusaria pustulata* seems to require higher light intensities than typical woodland members of the genus such as *P. amara*, *P. hypothamnolica*, *P. paratuberculifera*, and *P. velata*. This species is among the smallest of our local *Pertusaria* taxa, although in favorable sites thalli often fuse to form large continuous patches. [stictic acid, xanthone]

***Pertusaria subpertusa* Brodo**

[PERTSU] - crustose

Locally frequent on boles and lower branches of smooth-barked hardwoods and *Juniperus* in mesic woodlands in the Lower Ozark region. Substrate trees include *Acer rubrum*, *Amelanchier arborea*, *Fagus grandifolia* and *Juniperus virginiana*. This species is unknown elsewhere in Missouri, and local populations are the northwesternmost known for this woodland endemic of eastern North America. Characteristics of this species are the dull gray to grayish green thallus with large, broadly rounded, well separated warts ranging up to 1 mm wide, with 2 slightly ornamented spores per ascus and a P⁺ red reaction. [fumarprotocetraric acid, xanthone]

***Pertusaria tetralthalamia* (Fée) Nyl.**

[PERTET] - crustose

Occasional on tree boles and larger branches in landscapes with remnant natural integrity. Although occurring on *Quercus* and *Carya*, the vast majority of records from the region are from *Juniperus virginiana*. Further west in the Missouri Ozarks, this species also occurs on *Juniperus ashei*. Dibben (1980) lists the substrate as prevailing hardwoods. Most Lower Ozark populations have 2 spores per ascus. See comments under *P. macounii*. [stictic acid, xanthone]

***Pertusaria texana* Müll. Arg.**

[PERTEX] - crustose

Frequent on boles and branches of trees in wooded uplands, typically in light shade. This species grows on both boles and upper branches of trees. In the latter habitat, it sometimes associates with *P. pustulata*, from which it can be distinguished by the pale ostioles and usually strong tincture of greenish yellow in the thallus of *P. texana*, as opposed to the dark or black ostioles and gray thallus of *P. pustulata*. [stictic & thiophaninic acids, xanthone]

Elsewhere in the Ozarks, *P. texana* is sometimes parasitized by *Minutoexcipula tuckeræ* V. Atienza & D. Hawksw., a small, black, lichenicolous deuteromycete with two-celled, brown conidiospores.

***Pertusaria trachythallina* Erichsen**

[PERTR] - crustose

Occasional on shaded boles and especially on large upper branches of smooth-barked hardwoods in somewhat mesic sites. Substrate trees include *Acer rubrum*, *Amelanchier arborea*, *Carpinus caroliniana*, and, most commonly, large upper branches of *Quercus coccinea*, *Q. rubra*, *Q. shumardii*, and *Q. velutina*. This species resembles a small *P. hypothamnolica*, and may be

overlooked. The UV- cortex and KOH+ instantly deep yellow reaction readily distinguish this species. [thamnolic acid]

Pertusaria valliculata Dibben

[PERVA] - crustose

Apparently infrequent in the Lower Ozark region, although somewhat more common in the northwestern Missouri Ozarks. This species occurs on a variety of deciduous trees and also on *Juniperus*, but is most common on *Carya* and all types of *Quercus*. It typically grows on shaded lower and mid boles, and more rarely on shaded lower branches. In the field this species is identical to the more common *P. paratuberculifera*, and must be examined microscopically. [lichexanthone]

Pertusaria velata (Turner) Nyl.

[PERVE] - crustose

Common on lightly shaded lower and mid boles of trees in wooded uplands. This species occurs on a wide variety of hardwoods, and in the lower Ozarks is especially common on *Carya texana*, *Quercus stellata*, and *Q. velutina*. Most material from the area is UV-, but UV+ yellow populations with lichexanthone occur through the area, with the same habitats and substrates as the typical chemotype. The population with lichexanthone was formerly called *P. pulchella* Malmé. [lecanoric acid, ± lichexanthone]

PETRACTIS Fr. (Gyalectaceae)

Saxicolous crustose lichens with immersed apothecia, photobiont *Trentepohlia* (?), asci thin-walled, I+ blue, without an apical dome, with 8 hyaline, multiseptate to submuriform (?) spores; 1 species in the region. This genus is very similar to *Gyalecta* and perhaps should be included within it.

Petractis farlowii (Tuck. ex Nyl.) Vězda

[PETFA] - crustose

Known only from moist shaded dolomite at the base of a massive bluff in Oregon County. This species closely resembles a *Gyalecta* with immersed apothecia.

PHAEOCALICIUM A. F. W. Schmidt (Mycocaliciaceae)

Crustose fungi with no apparent thallus and minute, black, stipitate, narrowly subcylindrical apothecia, photobiont lacking, asci single walled, with uniformly thickened apex and 8 ellipsoid, pale brownish, 1-septate spores with rounded apices — the asci tardily disintegrating after spore maturity, but not forming a mazedium; 1 species in the region.

Phaeocalicium polyporaum (Nyl.) Tibell

[PHAPO] - crustose

Frequent in woodlands, growing on thalli of the polyporous fungus *Trichaptum bifforme*, which inhabits rotting logs and standing dead snags. The *Trichaptum* appears to be especially common on *Quercus*.

PHAEOPHYSCIA Moberg (Physciaceae)

Small, narrow lobed dark gray to brownish foliose lichens, upper cortex K-, lower cortex usually dark, occasionally pale, usually with abundant simple rhizines; apothecia sessile, with a well-developed thalline margin; photobiont *Trebouxia*, asci *Lecanora*-type, with 8 ellipsoid, brown, 1-septate, thick-walled spores; 8 species in the region. References: Esslinger (1978).

1. Thallus sorediate.
 2. Medulla prevailing red *P. rubropulchra*
 2. Medulla white throughout.
 3. Upper cortex with fine white hairs, particularly near lobe tips *P. cernohorskyi*
 3. Upper cortex glabrous.
 4. Lower cortex dark throughout, or with a narrow pale marginal zone.
 5. Soredia coarsely granular and sometimes appearing almost isidioid, in poorly defined marginal and laminal soralia; thallus lobes 0.5-2 mm wide *P. adistola*
 5. Soredia farinose, in well-defined, rounded soralia; thallus lobes mostly up to 0.5 mm wide.
 6. Soralia strongly capitate and elevated, usually terminal or on small secondary lobes; thallus loosely adnate; larger lobes up to 0.5 mm broad *P. pusilloides*
 6. Soralia orbicular, sessile, usually laminal; thallus closely adnate; larger lobes up to 0.3 mm broad *P. insignis*
 4. Lower cortex pale.
 7. Larger thallus lobes to 0.3 mm broad; soralia laminal and often broader than the lobes; lower cortex paraplectenchymatous *P. insignis*
 7. Larger thallus lobes 0.5 or more mm broad, soralia marginal or laminal and narrower than their lobes; lower cortex prosoplectenchymatous *Physciella*
1. Thallus not sorediate, although sometimes with abundant fine marginal lobules.
 8. Thallus with abundant dissected marginal lobules; apothecia rare *P. squarrosa*
 8. Thallus lacking lobules; apothecia common.
 9. Upper cortex glabrous *P. ciliata*
 9. Upper cortex with fine white hairs, particularly near lobe tips and on thalline margins of apothecia *P. hirtella*

Phaeophyscia adistola (Essl.) Essl. [PHAAD] - foliose
 Common in shaded woodlands, often in mesic ravines. The typical habitat for this species is shaded, mossy ledges and boulders of both siliceous and carbonate rocks, although it infrequently occurs on mossy tree bases as well. The granular, almost isidiate-appearing soredia, and abundant projecting black rhizines are characteristic.

Phaeophyscia cernohorskyi (Nadv.) Essl. [PHACE] - foliose
 Although this species is an abundant weedy lichen in exposed disturbed habitats elsewhere in Missouri, in the Lower Ozark region it is only occasional, occurring in small numbers on trees in wooded uplands and along woodland edges, as well as on exposed old wood, lightly shaded rocks in disturbed areas, and even on old concrete. In woodlands, the thalli are typically small and fragmentary. *Juniperus virginiana* is a preferred substrate. The only other pubescent *Phaeophyscia* in our area is *P. hirtella*, with a more regular, better developed thallus, no soredia, and numerous apothecia.

Phaeophyscia ciliata (Hoffm.) Moberg [PHACI] - foliose
 Locally frequent on exposed to lightly shaded branches and boles of trees, particularly trees with less acidic bark, such as *Juglans nigra* and *Fraxinus americana*. This species requires higher light intensities than many of our woodland lichens. It occurs very rarely on lightly shaded rocks. This species sometimes grows in mixtures with *P. hirtella*.

Phaeophyscia hirtella Essl. [PHAHI] - foliose
 Uncommon, with habitats and substrates similar to those of *P. ciliata*; the two elements often occur together, although *P. ciliata* appears to be more common in the Lower Ozark region. See comments under *P. cernohorskyi*.

Phaeophyscia insignis (Mereschk.) Moberg

[PHAIN] - foliose

This diminutive lichen is known in our area only from two collections, occurring on hardwoods in light to moderate shade. The lower surface is usually pale over much of the thallus. Species of *Physciella* might be keyed here, but can be distinguished by their usually paler gray upper cortex, larger thallus lobes, and prosoplectenchymatous lower cortex. *Phaeophyscia insignis* is about the same size as *Hyperphyscia adglutinata*, but *Hyperphyscia* is more appressed, without evident well-developed rhizines, and has linear or oblong soralia, as opposed to the round soralia of *P. insignis*.

Phaeophyscia pusilloides (Zahlbr.) Essl.

[PHAPU] - foliose

Common on tree boles in woodlands, particularly on *Quercus* and *Carya* in wooded uplands. This species has a distinctive, greenish cast to the round, capitate soralia, which appear slightly elevated on the lobe tips.

Phaeophyscia rubropulchra (Degel.) Essl.

[PHARU] - foliose

Common in shaded woodlands, growing on rocks, logs, and lower portions of tree boles. This species has a browner thallus than other local taxa of *Phaeophyscia*, with characteristic, dark soralia. In some specimens, portions of the medulla are white. [skyrin]

Phaeophyscia squarrosa Kashiw.

[PHASQ] - foliose

Common on shaded rocks and tree bases in a variety of woodland habitats, but often in more mesic sites. This species, formerly called *Phaeophyscia imbricata* (Vain.) Essl., is easily recognized by the abundant, fine, isidia-like marginal lobules on the thallus. *Anaptychia palmulata* can be lobulate, but is bright green when wet, uniformly pale beneath with pale rhizines, and usually has apothecia. *Phaeophyscia squarrosa* is pale greenish gray when wet, dark beneath towards the center of the thallus, with black rhizines, and usually sterile.

PHLYCTIDIA Müll. Arg (Phlyctidaceae)

See generic synopsis for *Phlyctis*; I am unable to see any compelling differences between these taxa. Note that Hawksworth *et al.* (1995) consider this to be a synonym of *Phlyctis*.

Phlyctidia ludoviciana Müll. Arg.

[PHLLU] - crustose

Rare on lightly to moderately shaded boles of hardwoods, particularly *Carpinus caroliniana*, in mesic woodlands, particularly along small wooded streams, fens, and other sources of permanent humidity.

PHLYCTIS Wallr. (Phlyctidaceae)

Crustose lichens with pale gray, well-developed, rimose thalli and small immersed apothecia usually obscured by coarse pruina, thalline margin present but often poorly developed and irregular, photobiont chlorococcoid, asci thin-walled, not thickened at apex, with 1 hyaline, muriform spore; 1 species in the region.

Phlyctis ? argena (Spreng.) Flot.

[PHLAR] - crustose

Uncommon on shaded sandstone or rhyolite boulders and outcrops, typically in more humid sites such as along lightly shaded streams in natural areas. Frequent associates include *Buellia vernicoma*, *Flavoparmelia baltimorensis*, and *Pertusaria plittiana*. This species is typically corticolous throughout most of its range, but all known midwestern populations are saxicolous and sterile. [norstictic acid]

PHYLLOPSORA Müll. Arg (Biatoraceae)

Greenish corticolous lichens with a pale, obscure to obvious prothallus and isidioid-dissected, aggregated subsquamulose thallus, apothecia sessile, brown, convex, lacking a thalline margin,

photobiont *Trebouxia*, asci *Bacidia*-type, with 8 hyaline, short-fusiform, simple spores; 1 species in the region. Reference: Brako (1991).

Phyllopsora corallina (Eschw.) Müll. Arg.

[PHYCO] - crustose

Uncommon on shaded bases of mature trees, particularly *Quercus velutina*, in extensive woodlands. Local material does not contain lichen substances and is referable to var. *corallina*.

PHYSCIA (Schreb.) Michx. (Pyysciaceae)

Small, narrow lobed pale gray foliose lichens with a K+ yellow upper cortex, pale lower cortex with pale rhizines, sessile apothecia with thalline margins, photobiont *Trebouxia*, asci *Lecanora*-type, with 8 ellipsoid, brown, 1-septate, thick walled spores; 6 species in the region. Reference: Thomson (1963).

1. Thallus sorediate, the soredia sometimes appearing finely lobulate.

2. Lobes >0.5 mm broad; soredia laminal, in orbicular soralia *P. americana*

2. Lobes to 0.3 mm broad; soredia marginal or terminal, without well-defined soralia.

3. Thallus saxicolous on siliceous rocks; lobes typically ca. 0.15 mm, long and narrow, or up to 0.3 mm broad and short, slightly fan-shaped, and closely appressed, but lobes more than twice as long as wide *P. subtilis*

3. Thallus usually corticolous, very rarely on rocks and concrete in disturbed areas; some lobes typically >0.25 mm, short and less than twice as long as wide, with abundant side branches; loosely adnate *P. millegrana*

1. Thallus esorediate.

4. Thallus lobes <0.3 mm broad; saxicolous on siliceous rocks *P. halei*

4. Thallus lobes mostly >0.4 mm broad; substrates various, but uncommon on siliceous rocks.

5. Medulla K+ yellow; zeorin present *P. pumilior*

5. Medulla K-; zeorin absent *P. stellaris*

Physcia americana G. Merr.

[PHYAM] - foliose

Common on lightly shaded boles of a variety of hardwoods and *Juniperus virginiana*, with a predilection for *Quercus alba*, *Q. muehlenbergii*, and *Q. stellata*. This species also occurs on shaded dolomite. [atranorin, terpene]

Physcia halei J. W. Thomson

[PHYHA] - foliose

Rare and restricted to exposed to very lightly shaded, massive siliceous rock exposures, growing on both sandstone and igneous rocks. [atranorin]

Physcia millegrana Degel.

[PHYM] - foliose

Common and widely distributed, although seldom abundant in natural habitats. This species grows on boles and especially exposed branches of most types of trees, frequently associating with *Candelaria concolor* and *Physcia stellaris*. It can become abundant on trees in disturbed areas, such as in towns and cities and around residences and farmsteads. *Physcia millegrana* also grows on old boards, weathered wooden fence posts, old rusted iron, and rarely, on rocks and concrete. [atranorin]

Physcia pumilior R. C. Harris

[PHYPU] - foliose

Occasional on trees, usually in extensive woodland. Although this species occurs on both canopy branches and tree boles, in the Lower Ozark region it appears to be more characteristically associated with shaded tree boles and larger branches, as opposed to the morphologically similar *P. stellaris*, which is typically a species of canopy branches and young trees in high light intensities. A K test is necessary to reliably determine these two taxa. A larger, more robust species known elsewhere in the Ozarks that would key here is *P. aipolia* (Ehrh. ex Humb.) Hampe in Fűrnr., which has lobes more

than 1 mm broad, as opposed to the lobes of *P. pumilior*, which are prevailing less than 1 mm wide. [atranorin, zeorin]

Physcia stellaris (L.) Ach.

[PHYST] - foliose

Abundant on exposed to slightly shaded branches, especially young branches of canopy trees, where associates include *Amandinea polyspora*, *Arthonia caesia*, *Lecanora strobilina*, and *Lecidea varians*. This species also occurs on lightly shaded rocks, and even old asphalt shingles and rusty ironwork. [atranorin]

Physcia subtilis Degel.

[PHYSU] - foliose

Locally frequent on exposed to lightly shaded siliceous rocks, including both massive outcrops and smaller boulders and fragments. Substrates include sandstone, chert, granite, and rhyolite. *Physcia subtilis* is described as having a K⁺ yellow medullary reaction, but all local material, and all Ozarkian material examined reacts K⁻. Esslinger and Egan (1996) point out that the medulla of *P. subtilis* is actually K⁻. The taxonomy of this complex in the region is problematical: Thomson (1963) indicates that *P. subtilis* has spores 8-13 × 6.5 μm, while related narrow-lobed species, such as *P. intermedia* Vain. and *P. teretiuscula* (Ach.) Lynge (both now considered synonymous with *P. dubia* (Hoffm.) Lettau, a usually broader lobed species), have spores 16-25 × 7-11 μm. The single fertile collection examined from the lower Midwest, from northeastern Oklahoma (Ladd 18459), has spores ranging from 11 to 18 μm long! There are two entities involved in the region: a woodland taxon with elongate, narrow lobes <0.15 mm broad, with narrow terminal branching and marginal granular-lobulate soredia, and a taxon of more exposed habitats in prairies and glades, with shorter, more fan-like lobes closely adjacent and ranging up to ca. 0.3 mm broad, with fewer obscure soredia mostly associated with or under the lobe tips. Both elements are known from the Lower Ozark region, and probably represent distinct species. [atranorin]

PHYSIELLA Essl. (Physciaceae)

Narrow lobed, pale gray foliose lichens with a K⁻ upper cortex and a pale, prosoplectenchymatous lower cortex, apothecia sessile, with thalline margin, photobiont *Trebouxia*, asci *Lecanora*-type, with 8 ellipsoid, brown, 1-septate, thick-walled spores; 2 species in the region. References: Esslinger (1986).

1. Soralia marginal and terminal, mostly hooded and labriform or crescent shaped *P. chloantha*

1. Soralia prevailing round and laminal, occasionally some marginal soralia present but these not hooded or labriform *P. melanchra*

Physciella chloantha (Ach.) Essl.

[PHYCH] - foliose

Occasional on shaded boles of hardwoods and especially shaded, mossy boles of *Juniperus virginiana*; also in shaded dolomite. At first glance this species looks like a *Physcia*, but lacks atranorin in the cortex and reacts K⁻.

Physciella melanchra (Hue) Essl.

[PHYME] - foliose

Infrequent; usually growing on shaded tree bases, or occasionally on the shaded lower boles of trees, sometimes found in anthropogenically disturbed areas.

PHYSCONIA Poelt (Physciaceae)

Narrow-lobed, brown or grayish, often pruinose, sorediate, foliose lichens with a rhizinate lower cortex, apothecia sessile and laminal, with a thalline margin, photobiont *Trebouxia*, asci *Lecanora*-type, with 8 brown, ellipsoid, thick-walled, 1-septate spores; 2 species in the region. Reference: Esslinger (1994).

1. Medulla C⁺ red (gyrophoric acid) *P. kurokawae*

1. Medulla C- (gyrophoric acid absent) *P. leucoleiptes*

Physconia kurokawae Kashiw. [PHYKU] - foliose
Uncommon, in habitats similar to those of *P. leucoleiptes* with which it is sometimes associated.
[gyrophoric acid; secaloncic acid A in soralia]

Physconia leucoleiptes (Tuck.) Essl. [PHYLE] - foliose
Frequent on shaded lower boles of hardwoods and *Juniperus*, as well as on shaded rocks, both carbonate and siliceous. Previous reports of *P. detera* (Nyl.) Poelt from the region are referable here. [secaloncic acid A in soralia]

PLACIDIOPSIS Beltr. (Verrucariaceae)

Saxicolous lichens with tiny gray squamulose thalli, with immersed perithecia, photobiont *Trebouxia*-like, asci resembling those of *Verrucaria*, with 8 small, hyaline, ellipsoid, 1-septate spores; 1 species in the region. Reference: Harris (1979b).

Placidiopsis minor R. C. Harris [PLAMI] - crustose
Known only from rhyolite fragments in a seasonally moist bedrock depression in an extensive rhyolite glade near the summit of Stegall Mountain in Carter County. As Harris (1979) points out, at first glance this species resembles an *Acarospora*.

PLACIDIUM (Flot.) Breuß (Verrucariaceae)

Brown squamulose lichens with well developed thalli and immersed perithecia, photobiont *Myrmecia* and *Trebouxia*, asci thin walled, with 8 simple, hyaline, ellipsoid spores; 2 species in the region. References: Breuß (1996), McCune (1987), Thomson (1987).

1. Thallus terricolous, of ± discrete squamules; rhizines lacking *P. squamulosum*

1. Thallus corticolous or occasionally saxicolous on mossy dolomite, thallus of fused and overlapping squamules; rhizines abundant *P. tuckermanii*

Placidium squamulosum (Ach.) Breuß [PLASQ] - squamulose
Frequent in its limited habitat: dolomite glades on exposed thin soils over carbonate bedrock, in areas with minimal competition from vascular vegetation. In higher quality glades, *Heppia adglutinata* and *Psora decipiens* are consistent associates.

Placidium tuckermanii (Ravenel ex Mont.) Breuß [PLATU] - squamulose
Occasional on lower boles of trees in lightly shaded uplands, and uncommonly on shaded, mossy dolomite. This species exhibits a preference for *Fraxinus* and white oaks (*Quercus alba*, *Q. muehlenbergii* and *Q. stellata*). A typical habitat is on trees bordering dolomite glades.

PLACYNTHIELLA Elenkin (Trapeliaceae)

Lignicolous crustose lichens with dark brown thalli composed of tiny coralloid-isidiate granules, apothecia sessile, brown, lacking a thalline margin, photobiont *Chlorella*?, asci resembling those of *Trapelia*, with H⁺ bluish apical dome, lacking an ocular chamber, with 8 hyaline, ellipsoid, simple spores; 1 species in the region.

Placynthiella icmalea (Ach.) Coppins & P. James [PLAIC] - crustose
Common but often overlooked, on lightly to moderately shaded decorticate logs and stumps in woodlands. From a distance, the minute brown thalli resemble rotting wood. [gyrophoric acid]

PLACYNTHIUM (Ach.) Gray (Placynthiaceae)

Saxicolous gelatinous lichens with crustose to placodioid or subfoliose thalli, apothecia sessile, thalline margin absent, photobiont *Dichothrix* and *Scytonema*, asci *Peltigera*-type, with 8 hyaline, ellipsoid, 1-3 septate spores; 2 species in the region. Reference: Hemssen (1963).

1. Thallus crustose to placodioid, isidiate; conspicuous blue-black prothallus present *P. nigrum*

1. Thallus subfoliose, with well-developed narrow lobes, not isidiate; prothallus lacking *P. petersii*

Placynthium nigrum (Huds.) Gray

[PLANI] - crustose

Occasional on exposed to lightly shaded carbonate substrates, particularly in areas with somewhat moist microclimate. In the Lower Ozarks, this species grows on dolomite and sometimes even on old, shaded concrete.

Placynthium petersii (Nyl.) Burnham

[PLAPE] - foliose

Rare on exposed to lightly shaded dolomite ledges, boulders, and escarpments in upland sites, typically associated with glades and bluffs.

POLYBLASTIA A. Massal.

Saxicolous crust with thin, continuous, smooth, black thalli and perithecia immersed in tiny thallus warts, with minute apical ostioles, photobiont chlorococcoid, asci thin walled, *Verrucaria* type, with 8 pale, muriform spores; 1 species in the region.

Polyblastia sp.

[POLspp] - crustose

Known only from shaded chert fragments in a xeric wooded upland in MOFEP site 6, in Reynolds County.

POLYSPORINA Vězda (Acarosporaceae)

Saxicolous crustose lichens with thin to obscure or partly endolithic, gray thalli, apothecia sessile, without a thalline margin, the disks irregularly ridged and lumpy, paraphyses abundantly branched and anastomosed, photobiont *Myrmecia* or *Trebouxia*; asci strongly thickened apically, with an I- apical dome, with numerous, minute, bacilliform spores; 1 species in the region.

Polysporina simplex (Davies) Vězda

[POLSI] - crustose

Occasional on siliceous rocks in exposed to lightly shaded habitats, growing on sandstone and rhyolite. See comments under *Sarcogyne privigna*.

PORPIDIA Körb. (Porpidiaceae)

Saxicolous crustose lichens with white to grayish thalli and immersed or sessile apothecia lacking a thalline margin, photobiont chlorococcoid, asci *Porpidia*-type, with 8 hyaline, ellipsoid, simple spores; 2 species in the region. Reference: Gowan (1989).

1. Thallus thin, whitish; apothecia sessile, jet black, epruinose *P. tahawasiana*

1. Thallus thick, gray; apothecia mostly immersed, blue-gray, densely gray pruinose . . . *P. albocaerulescens*

Porpidia albocaerulescens (Wulfen) Hertel & Knoph

[PORAL] - crustose

Locally frequent in shaded mesic sites on siliceous rocks, typically on boulders at the base of moist talus slopes, on moist lower faces of massive bluffs, and on large boulders of rhyolite, chert, or sandstone in the bottom of narrow ravines. [stictic acid]

Porpidia tahawasiana Gowan

[PORTA] - crustose

Occasional on lightly shaded siliceous rocks, especially sandstone, in wooded uplands.

PROTOBLASTENIA (Zahlbr.) J. Steiner (Psoraceae)

Saxicolous crustose lichens with thin, sordid gray thalli and sessile, convex, orangish brown apothecia, thalline margin absent, photobiont chlorococcoid, asci *Porpidia*-type, with 8 hyaline, ellipsoid, simple spores; 1 species in the region.

Protoblastenia rupestris (Scop.) Steiner

[PRORU] - crustose

Locally frequent on lightly shaded dolomite, particularly on horizontal surfaces of both larger rocks and ledges and small fragments. Typical habitats include the lower edges of glades and along small runoff streams in upland water ways. [parietin]

PSEUDOCYPHELLARIA Vain. (Lobariaceae)

Large corticolous lichens with brown upper cortex, pale brown, pseudocyphellate, tomentose lower surface, and bright yellow marginal soralia and medulla, apothecia usually lacking, sessile, with thalline margin, photobiont *Chlorella* like or *Dictyochloropsis*, asci *Peltigera*-type, with 8 brown, fusiform-ellipsoid, 1-3 septate spores; 1 species in the region.

Pseudocypbellaria aurata (Ach.) Vain.

[PSEAU] - foliose

Known from a single locality in the region, on the bole of an old growth *Platanus occidentalis* along the outflow from Greer Spring, where it was discovered in 1986. This species is designated as Endangered in Missouri. [calycin, pulvinic acid, pulvinic dilactone]

PSORA Hoffm. (Psoraceae)

Squamulose lichens with sessile apothecia, thalline margin lacking, pigmented portions of apothecia reacting K⁺ reddish, photobiont *Myrmecia* and *Trebouxia*, asci with well-developed I⁺ blue apical dome with I⁺ darker blue central tube, with 8 hyaline, ellipsoid, simple spores; 2 species in the region. Reference: Timdal (1986).

1. Thallus margins tinged dark gray, notably darker than the upper cortex; on siliceous substrates, with rock or thin silty soil over rock *Psorula rufonigra*

1. Thallus margins usually white in a narrow zone, occasionally with some areas concolorous with the thallus; associated with carbonate rock or soils derived from carbonate rock.

2. Thallus saxicolous *P. pseudorussellii*

2. Thallus terricobus.

3. Medulla K⁺ yellow turning red (norstictic acid); apothecia mostly laminal (sometimes submarginal), reddish brown *P. russellii*

3. Medulla K⁻ (norstictic acid absent); apothecia marginal, black *P. decipiens*

[Psora decipiens (Hedw.) Hoffm.]

[PSODE] - squamulose

An infrequent but characteristic species of thin, exposed soil pockets on dolomite bedrock in glades. Known from many surrounding counties in the Ozarks, but yet to be vouchered from the Lower Ozark region, although it undoubtedly occurs here. This species is almost invariably accompanied by *Placidium squamulosum*, which has a brown thallus with concolorous margins and perithecia, as contrasted with the brick-reddish to pink or red-brown thallus, white margins, and black marginal apothecia of *P. decipiens*.

Psora pseudorusellii Timdal

[PSOPS] - squamulose

Locally frequent on exposed dolomite boulders and ledges in glades and on bluff summits.

Psora russellii (Tuck.) A. Schneid.

[PSORUS] - squamulose

Occasional on thin soils over dolomite bedrock in high quality glades, sometimes forming extensive mats. [norstictic acid]

PSORULA Gotth. Schneid. (Psoraceae)

Small lichens with thick, dark gray, lobed to crenulate squamules with slightly thickened margins, apothecia sessile, black, thalline margin absent, photobiont *Trebouxia*, asci with 8 hyaline, simple, narrowly ellipsoid spores; 1 species in the region. This genus differs from *Psora* in the K- reaction of all parts of the apothecia and the lack of oxalate crystals in the thallus.

Psorula rufonigra (Tuck.) Gotth. Schneid.

[PSORUF]

Occasional on exposed to very lightly shaded siliceous rocks, usually growing on flat surface in thin pockets of silty soil or with mosses such as *Hedwigia ciliata*. *Spilonema revertens* is a constant associate. Known from granite, rhyolite, sandstone, and rarely, chert.

PUNCTELIA Krog (Parmeliaceae)

Medium-broad lobed, light gray foliose lichens with a pseudocyphellate upper cortex, white to pale brown, rhizinate lower cortex, apothecia sessile, with a thalline margin, photobiont *Trebouxia*, asci *Lecanora*-type, with 8 simple, hyaline, ellipsoid spores; 5 species in the region. References: Adler (1997), Krog (1982), Wilhelm & Ladd (1992).

- 1. Thallus without diaspores *P. semansiana*
- 1. Thallus isidiate or sorediate.
 - 2. Thallus with fine cylindrical isidia, these usually dark at the tips *P. rudecta*
 - 2. Thallus sorediate, and sometimes also bearing small, ± flattened lobules.
 - 3. Soredia coarse and granulose; thallus frequently with partially corticate lobules
. *P. missouriensis*
 - 3. Soredia farinose; thallus not markedly lobulate.
 - 4. Thallus smooth; soredia often in round laminal soralia *P. subrudecta*
 - 4. Thallus foveolate-ridged; sorediate prevailingly associated with the ridges
. *P. perreticulata*

Punctelia missouriensis G. Wilh. & Ladd

[PUNMI] - foliose

Frequent on tree bases and massive exposures and boulders of siliceous rocks in lightly shaded areas of wooded uplands. This species has been confused with both *P. rudecta* and *P. subrudecta* because of misinterpretation of the coarse soredia and lobules. Even when the lobules of *P. missouriensis* appear isidioid, they are not dark tipped like the fine cylindrical isidia of *P. rudecta*. *Punctelia subrudecta* has farinose soredia in well-delimited soralia, whereas *P. missouriensis* has soredia in patches associated with the pseudocyphellae on the upper cortex. Recently, Adler (1997) has included this element within *P. punctilla* (Hale) Krog, but van Herk and Aptroot (2000) consider it a distinct species. As discussed by Wilhelm & Ladd (1991), there are distinctions that seem to warrant keeping local material as a separate entity at this time. [atranorin, lecanoric acid]

Punctelia perreticulata (Räsänen) G. Wilh. & Ladd

[PUNPE] - foliose

Uncommon, typically on exposed, often old growth, coniferous substrates (*Juniperus virginiana* and *Pinus echinata*), but also sometimes found on hardwoods in open woodlands. Although Adler and Ahti (1996) discuss morphological overlap between this taxon and *P. subrudecta*, there is a strong

correlation between habitat ecology and thallus morphology in the Interior Highlands. [atranorin, lecanoric acid]

Punctelia rudecta (Ach.) Krog [PUNRU] - foliose

In terms of both numbers and biomass, this is the most common and locally abundant lichen in the Lower Ozark region. It is nearly ubiquitous on a wide variety of trees, occurring on all but the youngest canopy branches. Other substrates include well-drained decorticate logs and mossy portions of both carbonate and siliceous rocks. [atranorin, lecanoric acid]

Corticolous specimens of *P. rudecta* on shaded boles of trees in woodlands are frequently parasitized by *Nectria parmeliae* (Berk. & M. A. Curtis) D. Hawksw. (Hypocreaceae), a lichenicolous fungus with fuzzy, orange-pink, globose perithecia sessile on the host thallus. The ascospores of the *Nectria* are unusual in that each ascus produces one or two large macroascospores and 4-5 markedly smaller microascospores; both spore types are hyaline, ellipsoid, and 1-septate. Other lichens that are parasitized by *N. parmeliae* in the Lower Ozarks include *Phycia americana* and *Pyxine soledata*. The host thallus becomes necrotic in the region of the *Nectria* infestation.

Punctelia semansiana (W.L. & C.F. Culb.) Krog [PUNSE] - foliose

Infrequent on lightly shaded, usually somewhat mesic faces of massive siliceous rock exposures, typically occurring on lower faces of massive cliffs and bluffs, and occasionally in bedrock exposures on glade margins, as well as on exposed hardwoods in these habitats. Rhyolite appears to be a preferred substrate, where associates include *Coccocarpia palmicola*, *Parmotrema madagascariaceum*, and *Usnea amblyoclada*. *Punctelia bolliana* (Müll. Arg.) Krog, a morphologically similar species occurring on corticolous substrates, particularly in exposed habitats, occurs elsewhere in the Ozarks and may grow in the region. [atranorin, lecanoric acid]

Punctelia subrudecta (Nyl.) Krog [PUNSU] - foliose

Occasional, usually on conifers in landscapes with remnant natural integrity. A favored substrate appears to be the lower boles and bases of *Pinus echinata* in open wooded uplands. See comments under *P. perreticulata*. [atranorin, lecanoric acid]

PYRENULA A. Massal. (Pyrenulaceae)

Corticolous crustose lichens with thin or obscure, continuous thalli and immersed perithecia, photobiont *Trentepohlia*, asci *Pyrenula*-type, with 8 brown, ellipsoid, 3-septate to muriform spores; 7 species in the region. References: Harris 1989, 1995).

1. Spores muriform, with several longitudinal divisions, 45-65 μm long *P. ravenelii*
1. Spores 3-septate (sometimes the median locules with a single longitudinal division in *P. subelliptica*), to 45 μm long.
 2. Terminal locules of spores directly against the exospore, appearing to be at the very ends of the spores; spores 13-32 μm long.
 3. Ostioles apical; thallus usually UV+ yellow (lichexanthone); hymenium heavily inspersed; spores 13-22 μm long *P. pseudobufonia*
 3. Ostioles lateral; thallus UV- (lichexanthone absent); hymenium not inspersed; spores 25-32 μm long *P. cuyabensis*
 2. Terminal locules of spores separated from exospore by a layer of endospore, the locules not appearing to be terminal; spores 21-46 μm long.
 4. Hymenium inspersed; medial lumina of spores elongate, notably longer than broad, and sometimes longitudinally divided *P. subelliptica*
 4. Hymenium not inspersed; medial lumina of spores \pm isodiametric, never longitudinally divided.
 5. Spores up to 26 μm long and 10 μm wide *P. micheneri*
 5. Spores 27-45 μm long and at least 12 μm wide.

6. Thallus UV+ yellow (lichexanthone); perispore with dark apical caps; spores 36-45 μ m long *P. caryae*
6. Thallus UV- (lichexanthone absent); perispore hyaline throughout; spores 27-38 μ m long *P. punctella*

Pyrenula caryae R. C. Harris [PYRCA] - crustose
Occasional on shaded boles of *Carya* in areas of extensive woodlands; typically growing on younger trees. Harris (1995) mentions that some specimens are lichexanthone deficient, although we have not seen this in local material. [lichexanthone]

Pyrenula cuyabensis (Malme) R. C. Harris [PYRCU] - crustose
Known only from a single collection from Carter County, growing on hardwoods in a mesic woodland.

Pyrenula micheneri R. C. Harris [PYRMI] - crustose
Known only from a single collection from Oregon County, growing on *Carpinus caroliniana* in a mesic woodland. This is the first collection of this taxon made in this century; see Harris (1989). Previously, this species was known only from a single nineteenth century collection each from Pennsylvania and Ontario.

Pyrenula pseudobufonia (Rehm) R. C. Harris [PYRPS] - crustose
Frequent on shaded boles of hardwoods in woodlands. This species grows on a variety of trees, and is especially common on mature *Quercus coccinea* and *Q. velutina* in wooded dry-mesic uplands. This is the only species of *Pyrenula* that is frequent in the region. [lichexanthone]

Pyrenula punctella (Nyl.) Trevis. [PYRPU] - crustose
Uncommon in mesic floodplain woodlands; known from shaded boles of *Carpinus caroliniana* and *Carya cordiformis*.

Pyrenula ravenelii (Tuck.) R. C. Harris [PYRRA] - crustose
Occasional on hardwoods in mesic areas. Local substrates are *Acer rubrum* and *Carpinus caroliniana*.

Pyrenula subelliptica (Tuck.) R. C. Harris [PYRSU] - crustose
Occasional in woodlands, usually in mesic sites. Found on a variety of hardwoods, although in the Lower Ozarks, *Acer rubrum* is the most common substrate.

PYRRHOSPORA Körb. (Lecanoraceae)

Corticolous crustose lichens with pale gray, continuous, granular thalli and sessile, bright orange-red apothecia lacking a thalline margin, photobiont *Trebouxia*, asci *Lecanora*-type, with 8 small, hyaline, ellipsoid, simple spores; 1 species in the region, but see also *Lecidea varians*.

Pyrrhospora russula (Ach.) Hafellner [PYRRU] - crustose
Known only from exposed small branches of *Ulmus alata* growing along a rhyolite shut-ins in a natural area in Shannon County. This is a common species of the Gulf coastal plain in the southeastern states, but becomes rare in the Interior Highlands of Arkansas. The Lower Ozark record is the only known station in Missouri. [fumarprotocetraric acid, lichexanthone]

PYXINE Fr. (Physciaceae)

Narrow-lobed, sorediate, foliose lichens with pigmented medullary tissue and black rhizinate lower cortex, apothecia sessile, at least initially with a thalline margin, photobiont *Trebouxia*, asci *Lecanora*-type, with 8 brown, thick-walled, ellipsoid, 1-septate spores; 2 species in the region.

1. Upper cortex UV+ yellow, K- (lichexanthone, atranorin absent), with discrete patches of fine white pruina near lobe tips, the pruina appearing continuous within the patch even at 15× magnification *P. subcinerea*

1. Upper cortex UV-, K+ yellow (lichexanthone absent, atranorin), epruinose or more commonly with diffuse pruinose patches on the lobes, the pruina appearing granular and readily distinguishable at 15× magnification *P. subcinerea*

Pyxine soreliata (Ach.) Mont. [PYXSO] - foliose
Very common on shaded lower boles and bases of hardwoods in wooded uplands, as well as on shaded, often mossy chert, dolomite, sandstone, and igneous rocks. This species is more regularly saxicolous than is *P. subcinerea*. [atranorin]

Pyxine subcinerea Stirt. [PYXSU] - foliose
Abundant throughout woodlands in the region, occurring on all levels of trees in wooded uplands, but seldom detected in the canopy, where it often occurs as small thallus fragments. This species has been recorded from most hardwood substrates growing in the region, as well as on *Juniperus virginiana*. It rarely occurs on shaded rocks in uplands, where it has been documented from dolomite and sandstone. [lichexanthone, terpenes]

RAMALINA Ach. (Ramalinaceae)

Yellowish green fruticose lichens with basally attached, flattened, shrubby thalli, apothecia sessile to substipitate, with thalline margin and pale tan disks, photobiont *Trebouxia*, asci *Bacidia*-type, with 8 hyaline, narrowly ellipsoid, 1-septate, sometimes curved spores; 1 species in the region. Reference: LaGreca (1999).

Ramalina culbersoniorum LaGreca [RAMCU] - fruticose
Occasional in the upper half of canopy trees in woodlands, as well as sometimes on lightly shaded lower boles. This species can become locally abundant in limited areas along glade margins or in clearings reverting to young woodland, but this only occurs in rare instances, and many seemingly similar sites are devoid of *Ramalina*. Some populations in the region contain lecanoric acid in the medulla and react C+ red — this is chemical strain 5 of Culberson *et al.* (1990). These populations are morphologically analogous to the C- populations, but the lecanoric acid containing strain is more likely to occur in extensive mature woodlands, in moderately heavy shade. Taxonomy of local *Ramalina* populations is problematical; there is almost certainly more than one species represented in the confusing complex of morphologies in the Lower Ozark region. *Ramalina americana* Hale, containing usnic acid only, is morphologically similar to *R. culbersoniorum*; populations occur just south of the Lower Ozark region. *Ramalina intermedia* (Delise ex Nyl.) Nyl. is a rare species of massive, sheltered, lightly shaded siliceous rocks in portions of the Ozarks bordering our region; it has much smaller, linear thalli that are soreliate. [usnic acid, plus divaricatic and/or lecanoric acids]

RHIZOCARPON Ramond ex DC. (Rhizocarpaceae)

Saxicolous crustose lichens with rimose to areolate thalli, apothecia marginal or attached to hypothallus, photobiont chlorococcoid, asci *Rhizocarpon*-type, with 8 hyaline to green or brown, 1-septate to more commonly muriform spores; 3 species in the region. Reference: Fryday (2000).

1. Thallus of separate areoles; medulla C+ pink (gyrophoric acid); spores greenish to brown *R. grande*

1. Thallus rimose to continuous areolate; medulla C- (gyrophoric acid absent); spores hyaline (sometimes becoming pale brownish in age).

2. Spores 2-celled *R. cinereovirens*

2. Spores muriform *R. reductum*

Rhizocarpon cinereovirens (Müll. Arg.) Vain. [RHICI] - crustose
Rare locally, on lightly shaded sandstone in woodlands; slightly more common just north of the region.
[(±?) norstictic or stictic acids]

Rhizocarpon grande (Flörke ex Flot.) Arnold [RHIGR] - crustose
Occasional on exposed, massive siliceous escarpments, usually associated with glades and bluffs.
This species occurs on igneous substrates in the region, but is also known from massive chert exposures in the western Ozarks. [gyrophoric & stictic acids]

Rhizocarpon reductum Th. Fr. [RHIRE] - crustose
Known only from lightly shaded to exposed siliceous rocks in Shannon County. At one site, in a massive igneous canyon system, it occurs on lightly shaded, mesic, igneous talus, associated with *Ochrolechia yasudae* and *Fuscoparmaria leucosticta*. [stictic acid]

RHIZOPLACA Zopf (Lecanoraceae)

Thickly areolate to umbilicate lichens with yellow-green upper cortex, centrally attached, lacking rhizines, with sessile, tan, crenulate to incised apothecia having a somewhat irregular thalline margin, photobiont *Trebouxia*, asci *Lecanora*-type, with 8 simple, hyaline, ellipsoid spores; 1 species in the region. Reference: McCune (1987).

Rhizoplaca chrysoleuca (Sm.) Zopf [RHICH] - foliose
Uncommon on massive exposures of siliceous rocks on glades, bluffs, and ledges. Common associates include *Acarospora fuscata*, *Candelariella vitellina*, *Dimelaena oreina*, and various *Xanthoparmelia* species. Ozark material consists of confluent masses of stalked, bullate areoles; this morphology is sometimes segregated as *R. subdiscrepans* (Nyl.) R. Sant. [pseudoplacodiolic & usnic acids]

RIMELIA Hale & A. Fletcher (Parmeliaceae)

Broad lobed, light gray foliose lichens with marginal cilia, a reticulately maculate or cracked upper cortex and a dark, rhizinate lower cortex, apothecia sessile, with a thalline margin, photobiont *Trebouxia*, asci *Lecanora*-type, with 8 simple, hyaline, ellipsoid spores; 3 species in the region. See key to *Parmotrema*.

1. Thallus sorediate or isidiate.
 2. Thallus marginally sorediate *R. reticulata*
 2. Thallus with laminal isidia *R. subisidiosa*
1. Thallus without diaspores *R. cetrata*

Rimelia cetrata (Ach.) Hale & A. Fletcher [RIMCE] - foliose
Uncommon on boles and larger branches of trees in woodlands. Especially when young, this species can be difficult to separate from *Parmotrema eurysacum*. Young thalli of *Rimelia reticulata* are often not sorediate, or with only a single small area of soredia on the thallus. If the soredia are overlooked or not included in a collection, it would be impossible to reliably identify the material. [atranorin, salazinic acid]

Rimelia reticulata (Taylor) Hale & A. Fletcher [RIMRE] - foliose
Very common; this species, *Flavoparmelia caperata*, *F. baltimorensis*, and *Punctelia rudecta* are the most common large foliose species in our lichen flora. Typical habitats for *R. reticulata* include boles and bases of trees in mature woodlands, well-drained decorticate logs in open woodlands, lightly shaded siliceous rocks, and even mossy dolomite exposures and stable *Juniperus* needle humus over rocks. See comments under *R. cetrata* above. [atranorin, salazinic acid]

Rimelia subsidiosa (Müll. Arg.) Hale & A. Fletcher [RIMSUBI] - foliose
Rare; the few collections in the region are from extensive, mature woodlands, where it occurs on lightly shaded cherty dolomite, and on lightly shaded tree bases. This species is at the northern edge of its interior range in the Lower Ozark region. The isidia are small, granular, and typically appear subsorediate. [atranorin, salazinic acid]

RINODINA (Ach.) Gray (Physciaceae)

Small crustose lichens with continuous to areolate or obscure thalli, apothecia sessile to subimmersed, with a well-developed thalline margin, photobiont *Trebouxia*, asci *Lecanora*-type, with 8 brown or greenish, ellipsoid, 1-septate spores with thick walls and often with angular or prismatic lumina; at least 6 taxa in the region — a poorly understood and complex genus with most species easily overlooked and thus locally under-collected. Data regarding local habitat, substrate, distribution, and ecology are largely unknown or based on so few observations as to be largely conjectural.

1. Thallus corticobous.
 2. Thallus with minute, isidioid papillae *R. papillata*
 2. Thallus smooth.
 3. Thallus olive; spores up to 19 µm long; zeorin absent *R. applanata*
 3. Thallus whitish, spores 19-20 µm long; zeorin present *R. subminuta*
1. Thallus saxicolous on siliceous rocks.
 4. Thallus K+ yellow, atranorin present) *R. oxydata*
 4. Thallus K-, atranorin absent.
 5. Lumina of spores narrow and V shaped *R. cana*
 5. Lumina of spores rounded to angular, ± isodiametric *R. tephraspis*

Rinodina applanata H. Magn. [RINAP] - crustose
Known from a few collections from hardwood twigs and branches in woodlands.

Rinodina cana (Arnold) Arnold [RINCA] - crustose
Known from a Richard Harris collection on rhyolite from Shannon County; he describes the thallus as dark gray or gray brown, areolate, with mostly immersed apothecia and having the aspect of a small dark *Aspicilia*.

Rinodina oxydata (A. Massal.) A. Massal. [RINOX] - crustose
Locally common on massive exposures of siliceous rocks. This species has a more mineral gray thallus than does *R. tephraspis*, which has a brownish gray thallus and generally occurs in more shaded sites. [atranorin]

Rinodina papillata H. Magn. [RINPA] - crustose
Seldom collected, but easily overlooked and probably common. This species occurs as small patches of somewhat lustrous, thin, papillate areoles. It typically grows on upper branches and boles of hardwoods, and is often sterile.

Rinodina subminuta H. Magn. [RINSU] - crustose
Apparently uncommon, on lightly shaded branches and boles of hardwoods. [zeorin]

Rinodina tephraspis (Tuck.) Herre [RINTE] - crustose
Apparently frequent on lightly shaded siliceous rocks in wooded uplands throughout the region. The thallus is a distinctive brownish gray and reacts C+ pinkish. [zeorin, ± 5-O-methylhiasic acid]

SANTESSONIELLA Henssen (Pannariaceae)

Small dark brown, foliose to subsquamulose, somewhat gelatinous lichens with sessile brown apothecia that lack a thalline margin at maturity, photobiont *Nostoc*, asci with indistinct I+ blue apical ring structure and 8 simple, hyaline, ellipsoid spores; 1 species in the region. Reference: Jørgensen (2001).

Sante ssoniella crossophylla (Nyl.) P.M. Jørg.

[SANCR] - foliose

Known only from moist shaded sandstone outcrops in an extensive wooded canyon system at Sparkling Hollow in Howell County. This species looks like a small *Pannaria*.

SARCOGYNE Flot. (Acarosporaceae)

Saxicolous crustose lichens with thin to obscure or partly endolithic, gray thalli, apothecia sessile, plane, without a thalline margin, paraphyses unbranched, photobiont *Myrmecia* and *Trebouxia*; asci strongly thickened apically, with an I- apical dome, with numerous, minute, bacilli form spores; 3 species in the region. Magnusson (1934).

1. On HCl+ (carbonate) rock; disks pruinose *S. regularis*

1. On HCl- (siliceous) rock; disks not pruinose.

2. Disks black to slightly reddish; exciple brown; frequent *S. similis*

2. Disks reddish, becoming almost wine red when wet; exciple black; rare *S. privigna*

Sarcogyne privigna (Ach.) A. Massal.

[SARPR] - crustose

Known only from an old granite quarry along the Current River south of Van Buren, growing on exposed granite. If mistaken for a *Sarcogyne*, *Polysporina simplex* would key here — it has branched and anastomosing paraphyses and the disk is irregularly ridged and lumpy, as contrasted with the unbranched paraphyses and smooth disks of *Sarcogyne*.

Sarcogyne regularis Körb.

[SARRE] - crustose

Locally frequent on exposed, often weathered, carbonate substrates, ranging from massive bedrock to small pebbles and fragments. This species is occasional in glades and on massive escarpments. It is sometimes frequent on limestone and dolomite blocks in walls, old concrete, and limestone paving stones. The apothecia are usually densely pruinose.

Sarcogyne similis H. Magn.

[SARSI] - crustose

Frequent on siliceous rocks in a variety of habitats, typically in uplands, on igneous and especially sandstone substrates. This species grows on small fragments and massive boulders and ledges, and occurs in both exposed sites and in light shade. The thallus is often obscure, with only the apothecia apparent.

SCHISMATOMMA Flot. & Körb. ex A. Massal. (Rocellaceae)

Corticolous crustose lichens with thin, ± continuous thalli, or thalli not evident, photobiont *Trentepohlia*, Apothecia somewhat elongated and partially immersed in the substrate, usually with white pruina, asci apically thickened, with I+ blue apical ring and 8 hyaline, 4-celled, bacilli form spores; 1 species in the region.

Schismatomma glaucescens (Nyl. ex Willey) R.C. Harris

[SCHGL] - crustose

Occasional in wooded uplands, but often overlooked, on lightly shaded boles of the red oak group, particularly *Quercus coccinea*. This species usually occurs along the rough angled bark on the sides of broad bark fissures, and appears as a pale brownish zone with small, elliptical whitish pruinose apothecia.

SCOLICIOSPORUM A. Massal. (Lecanoraceae)

Small crustose lichens with thin, scurfy, often obscure thalli and tiny, sessile, ultimately convex, black or brown apothecia, photobiont chlorococcoid and reported as often forming goniocysts, asci *Lecanora*-type, with 8 hyaline, fusiform to acicular, multi-septate spores which are often notably twisted or curved, especially in the ascus; 1 species in the region.

Scoliciosporum umbrinum (Ach.) Arnold

[SCOUM] - crustose

Infrequent on siliceous rocks in exposed to shaded, mesic to dry sites; known from sandstone and rhyolite in a variety of habitats. A corticolous species known from portions of the Ozarks north and west of our region, *S. chlorococcum* (Graewe ex Stenh.) Vězda, is likely to occur in the region as well. It occurs on boles and branches of *Juniperus* and hardwoods with circumneutral or basic bark pH and has straight spores up to 4-5 µm broad, whereas *S. umbrinum* has somewhat twisted spores that are 2-3 µm broad.

SPEERSCHNEIDERA Trevis. (Lecanoraceae)

Saxicolous foliose lichens with elongate, narrow, imbricated lobes and thick, tough upper cortex, lower surface pale, apothecia sessile, with brown disk and well-developed thalline margin, photobiont *Trebouxia*, asci *Lecanora*-type, with 8 hyaline, narrowly ellipsoid, 1 (rarely 2-3) septate spores; 1 species in the region. Reference: Hafellner & Egan (1981).

Speerschneidera euploca (Tuck.) Trevis.

[SPEEU] - foliose

Rare on massive, lightly shaded dolomite faces, typically associated with bluffs; often in areas sheltered from precipitation and direct runoff. At first glance, this species resembles a narrow-lobed *Physcia*, but the thallus is notably tougher and the lobes are more imbricated and subterete. The dry thallus is gray-brown, but turns green when wet - although not as bright green as does the thallus of *Anaptychia palmulata*.

SPHINCTRINA Fr. (Sphinctrinaceae)

Lichenicolous fungi lacking an evident thallus and photobiont, apothecia subglobose, lustrous black, on stout black stipes, asci single walled, 1-, eventually disintegrating, with 8 simple, brown, ellipsoid, ± ornamented spores; 1 species in the region.

Sphinctrina tubiformis A. Massal.

[SPHTU] - crustose

Uncommon on thallus of *Pertusaria* in wooded uplands; *P. paratuberculifera* is the most common host. This species occurs as scattered stipitate black apothecia on the host thallus.

SPILOEMA Bornet (Coccocarpiaceae)

Minutely shrubby black crustose lichens consisting of algal filaments irregularly surrounded by hyphae, with blue green rhizoidal hyphae at the substrate attachment point, apothecia small, sessile, lateral, thalline margin lacking, photobiont *Hyphomorpha* or *Stigonema*, asci with a cylindrical 1+ blue apical dome, with 8 hyaline, narrowly ellipsoid, simple spores; 1 species in the region.

Spilonema revertens Nyl.

[SPIRE] - crustose

Occasional on massive, horizontal siliceous rock exposures in full sun or light shade, often growing on thin silty soil pockets over rock, or in association with mosses such as *Hedwigia ciliata*. In midwestern North America this species is always associated with *Psorula rufonigra*, and neither *Psorula* or *Spilonema* has been seen without being in direct contact with the other.

STAUROTHELE Norman (Verucariaceae)

Saxicolous crustose lichens with brown, rimose-areolate thalli and dark, immersed perithecia, photobiont *Protococcus* and *Trebouxia*, asci lacking an ocular chamber, with 8 hyaline to brownish, muriform spores; 1 species in the region. Reference: Thomson (1991).

Staurothele diffractella (Nyl.) Tuck.

[STADI] - crustose

Occasional on shaded, massive dolomite boulders, ledges, and outcrops, often growing with mosses. This species also rarely occurs on shaded siliceous rocks in lightly shaded, mesic sites. The thallus consists of contiguous areoles, and the hymenium lacks algae, as compared with the discrete, non-confluent areoles of *Endocarpon pusillum*, which has algal cells in the hymenium

STENOCYBE (Nyl.) Korb. (Mycocaliciaceae)

Crustose fungi with no thallus and minute, black, stipitate apothecia (stipes frequently forking, with each branch terminating in an apothecium), photobiont absent, asci single walled, with thickened apex, tardily disintegrating after spore maturity but not forming a mazaeidium, with 8 ellipsoid, 1-3-septate, light brown spores; 1 species in the region.

Stenocybe pullatula (Ach.) Stein

[STEPU] - crustose

Local and restricted to bark of *Alnus serrulata*, usually growing on middle and lower portion of stems in lightly shaded, stable *Alnus* stands associated with high quality streams, and restricted to areas without significant flood scouring.

STRIGULA Fr. (Strigulaceae)

Corticolous crustose lichens with thin, pale, undifferentiated thalli and dark, immersed to subsessile perithecia, photobiont *Trentepohlia*, asci with a large apical dome penetrated by an ocular chamber, with 8 hyaline, ellipsoid to fusiform, 1- to multi-septate spores; 3 species in the region. Reference: Harris (1995).

1. Spores 5+ septate, (5.5)6-7 μ m broad.

2. Thallus dark grayish or greenish; spores 7-septate, 24-35 μ m long, none of the cells longitudinally divided *S. stigmatella*

2. Thallus whitish to pale gray; spores 5-7-septate, 20-28 μ m long, usually with 1-2 of the cells longitudinally divided *S. submuriformis*

1. Spores 1-3-septate, up to 6 μ m broad.

3. Spores 1-septate *S. americana*

3. Spores 3-septate *S. jamesii*

Strigula americana R. C. Harris

[STRAM] - crustose

Apparently rare or overlooked; in the Interior Highlands of Missouri and Arkansas, currently known only from two localities in the Lower Ozark region, growing on shaded lower boles of hardwoods in mature woodlands.

Strigula jamesii (Swinsc.) R. C. Harris

[STRJA] - crustose

Rare or overlooked, on lower boles and bases of large hardwoods in extensive mature woodlands; local populations are from *Quercus alba*.

Strigula stigmatella (Ach.) R.C. Harris

[STRST] - crustose

Known from a single site at the base of *Quercus rubra* in a mesic woodland.

Strigula submuriformis (R. C. Harris) R. C. Harris [STRSU] - crustose

Uncommon on shaded lower boles of a wide variety of hardwoods, typically those with smooth bark. This species occurs higher on the bole, and in higher light intensities, than other local taxa of *Strigula*, and is not restricted to areas of extensive intact woodlands.

SYNALISSA Fr. (Lichinaceae)

Minutely shrubby, fruticose, gelatinous lichens with closely clustered compact branches of terete lobes, apothecia terminal and initially poriform, later expanding, with a well developed thalline margin, photobiont *Gleocapsa* (with a reddish, K+ purplish sheath), asci thin walled, I-, with 8 or more simple, hyaline, broadly ellipsoid spores; 1 species in the region.

Synalissa symphorea (Ach.) Nyl. [SYNSY] - gelatinous

Uncommon, but possibly overlooked, on massive exposures of carbonate rock, typically on glades or large bluffs.

TELOSCHISTES Norman (Teloschistaceae)

Shrubby fruticose lichens with a central holdfast and flattened, dorsoventrally differentiated thalli, apothecia marginal and terminal, with thalline margin, photobiont *Trebouxia*, asci *Teloschistes*-type, with 8 hyaline, ellipsoid, polarilocular spores; 1 species in the region.

Teloschistes chrysophthalmus (L.) Th. Fr. [TELCH] - fruticose

Rare in older canopy branches of trees in established woodlands, and sometimes on lower boles and branches of smaller trees and shrubs in glades. This species is locally common on the extensive dolomite glades in the White River section of the western Missouri Ozarks, as well as in prairie regions in the eastern Great Plains, including the Osage Plains immediately west of the Ozarks. It is rare in the eastern part of Missouri, including the Lower Ozarks. The apothecia are typically bright orange, and the thallus is orange tinged with grayish hues. In plants surviving in more shaded conditions, the thallus is a dull yellowish gray and the apothecia are a more subdued yellow-orange. [parietin]

TEPHROMELA M. Choisy (Tephromelataceae)

Gray crustose lichens with verrucose, continuous to rimose thalli, apothecia sessile, with black disk and well-developed, low, thalline margin; photobiont chlorococcoid, asci *Bacidia*-type, with 8 hyaline, ellipsoid, simple spores; 1 species in the region.

Tephromela atra (Huds.) Hafellner [TEPAT] - crustose

Known only from a massive rhyolite face above a fast-flowing permanent shut-in in Shannon County. This species has a deep reddish or purplish brown epithecium and hymenium. [atranorin]

THELIDIUM A. Massal. (Verrucariaceae)

Saxicolous crustose lichens on carbonate substrates, thalli thin, sordid whitish to pale gray, sometimes suffused with pink, perithecia small, mostly immersed in pits in the substrate, photobiont *Protococcus* and/or *Trebouxia*, asci \pm thick-walled, I-, with a small ocular chamber but no apical structures, with 8 hyaline, ellipsoid, 1-3-septate spores; 1 species in the region.

Thelidium incavatum Mudd. [THEIN] - crustose

Uncommon on limestone and dolomite in lightly shaded to exposed beds of temporary runoff streams, and along the margins of larger streams, often growing on small loose rock pieces. The perithecia are often pinkish-purple, and resemble the perithecia of *Verrucaria marmorea*, a species of dry exposed limestone and dolomite in the northern and western Ozarks that has not yet been documented from our region.

THELOPSIS Nyl. (Gyalectaceae)

Cryptic, inconspicuous, corticolous crustose lichens with obscure thalli and tiny grayish to brownish perithecia, photobiont *Trentepohlia*, asci thin walled and undifferentiated apically, with numerous small, ellipsoid, simple spores; 1 species in the region. Reference: Harris (1979a).

Thelopsis flaveola Arnold

[THEFL] - crustose

Occasional but overlooked, on lightly to moderately shaded boles of mature hardwoods in extensive woodlands with remnant natural integrity. This species has an obscure, continuous, thin grayish thallus with tiny, cryptic perithecia, and is difficult to see in the field, even when cursorily examining bark with a hand lens. All of the Missouri records were discovered when conducting disciplined corticolous sampling of plots on tree boles - usually when material was removed detailed examination.

THROMBIUM Wallr. (Thrombiaceae)

Terricolous crustose lichens with scant to obsolete thalli and immersed perithecia with dark ostioles and persistent paraphyses, photobiont *Leptosira*, asci thin-walled, with H+ blue apical cap and dome with narrow, cylindrical axial mass, with 8 simple, hyaline, ellipsoid spores; 1 species in the region. Reference: Bird & Beil (1972).

Thrombium epigaeum (Pers.) Wallr.

[THREP] - crustose

Very rare on exposed, well-drained, stabilized sand in Ripley County, growing in sites where competition from vascular vegetation is minimal.

THYREA A. Massal. (Lichinaceae)

Saxicolous gelatinous lichens with black or gray, foliose thalli typically with elongate strap-like lobes, apothecia small, immersed, mostly marginal, photobiont Chroococcales, asci thin walled, with 8 hyaline, simple, broadly ellipsoid spores; at least 1 species in the region, but part of a poorly understood polygeneric complex of taxa with seemingly abstruse generic delimitations.

Thyrea confusa Henssen

[THYCO] - gelatinous

Widely distributed in suitable habitats but never abundant, occurring on exposed to lightly shaded, massive dolomite on glades and upper portions of bluffs, often growing in channels receiving intermittent runoff or seasonal seepage. The thallus is usually sterile, consisting of narrow or somewhat expanded, basally attached lobes often clustered around a central attachment point. The thallus is typically densely pruinose and grayish. This name is applied to local material with extreme trepidation, and our material may include or consist of other members of the Lichinaceae. Another member of the Lichinaceae, *Psorotichia schaereri* (A. Massal.) Arnold, is a black crustose lichen of exposed hard carbonate rocks in the western Ozarks, and probably occurs in the Lower Ozarks as well. *Psorotichia schaereri* has a tiny granular-areolate thallus with often obscure granular isidia and dark brown apothecia. Several smaller black crustose taxa also occur on exposed carbonate substrates in the Ozarks, but their taxonomy and ecology remain unknown. Generic delimitations as currently applied in the Lichinaceae are morphologically abstruse and seem all but useless from a field perspective, especially since much of the material in the Interior Highlands is consistently sterile.

TRAPELIA M. Choisy (Trapeliaceae)

Saxicolous crustose lichens with pale gray, areolate thalli and small, sessile brown apothecia with obscure thalline margins which sometimes disappear in age, photobiont chlorococcoid, asci with I+ bluish apical dome, lacking an ocular chamber, with 8 hyaline, ellipsoid, simple spores; 1 species in the region.

Trapelia involuta (Taylor) Hertel

[TRAIN] - crustose

Occasional on small siliceous pebbles, rock fragments, and small cobbles in well drained, exposed to lightly shaded sites, such as along the edges of wooded uplands, on stable roadside embankments, and in upland old fields. In harsh sites, this species may be restricted to the sides or lower edges of rocks. [gyrophoric acid]

TRAPELIOPSIS Hertel & Gotth. Schneid. (Trapeliaceae)

Mostly lignicolous, occasionally corticolous crustose lichens with granular areolate, C+ pinkish thalli and sessile, black apothecia, thalline margin absent, photobiont *Chlorella*, asci thin-walled, with I- or I+ weakly blue apical dome, with 8 hyaline, ellipsoid, simple spores; 1 species in the region.

Trapeliopsis flexuosa (Fr.) Coppins & P. James

[TRAFL] - crustose

Frequent on sound, well-drained lignum in exposed to lightly shaded sites, growing on decorticate logs, stumps, and standing decorticate snags in wooded uplands, as well as on weathered exposed boards, particularly of *Thuja* or *Juniperus*, and on bark of *Pinus echinata* in lightly shaded wooded uplands. The thallus is composed of dark grayish green, thin, sorediate areoles, and the apothecia, when present, have plane disks. A species with thicker, gray areoles and convex apothecia, *T. granulosa* (Hoffm.) Lumbsch, occurs less commonly in similar habitats in the Ozarks, but has not been documented in the Lower Ozark region. [gyrophoric acid]

TRICHOTHELIUM Müll. Arg (Trichotheliaceae)

Small crustose lichens with dull, dark gray, continuous to rimose thalli and small, sessile, black perithecia with pale apical ostiole, photobiont *Trentepohlia*, asci thin-walled, with slight apical thickening, with 8 hyaline, elongate, multi-septate spores that are often attenuate-acuminate at one end; 2 species in the region. Reference: Harris (1995).

1. Corticolous; ascospores 8-13 celled, $38-50 \times 5.5-7.5 \mu\text{m}$ *T. cestrense*

1. Saxicolous; ascospores 8(9) celled, $32-45 \times 5-6 \mu\text{m}$ *T. guentheri*

Trichothelium cestrense (Tuck. ex E. Michener) R.C. Harris

[TRICE] - crustose

Occasional on shaded boles of hardwoods in mesic sites along streams and on wooded floodplain terraces and in ravines. In our region, the two most common substrates are *Carpinus caroliniana* and *Celtis occidentalis*. This species was formerly included in the genus *Porina*, as *P. cestrensis* (Tuck. ex E. Michener) Müll. Arg.

Trichothelium guentheri (Flot.) R.C. Harris

[TRIGU] - crustose

Apparently rare, but more likely overlooked; on lightly shaded siliceous rocks.

TRYPETHELIUM Spreng (Trypetheliaceae)

Corticolous crustose lichens with thin, continuous, sublustrous greenish to yellowish thalli, with dark perithecia clustered in carbuncular pseudostromata, photobiont *Trentepohlia*, asci bitunicate, with a broad, shallow ocular chamber, with 8 hyaline, fusiform, (3)7-9 septate spores, the cells of which are rhomboid to elliptical; 1 species in the region.

Trypethelium virens Tuck. ex E. Michener

[TRYVI] - crustose

Uncommon and local in mesic habitats, growing on shaded boles of trees with smooth, hard bark. Although *Fagus grandifolia* is a favored substrate throughout much of the range of this species, there is no *Fagus* in the Lower Ozark region, and local populations are usually on *Carpinus caroliniana*.

TUCKERMANNOPSIS Gyeln. (Parmeliaceae)

Loosely adnate, corticolous foliose lichens with greenish brown to olive or brown upper cortex, usually with abundant marginal black pycnidia, lower cortex pale to tan, rhizinate, apothecia sessile and usually marginal, with well-developed thalline margin, photobiont *Trebouxia*, asci *Lecanora*-type, with 8 hyaline, ellipsoid, simple spores; 3 species in the region.

1. Lobes small and narrow, to 0.4 mm broad; apothecia abundant; medulla C- and UV- (fatty acids only)
..... *T. fendleri*
1. Lobes larger and broader, many >1 mm broad; apothecia uncommon; medulla C+ red or UV+ white (alectoronic or olivetoric acids).
 2. Medulla C+ red, UV- (olivetoric acid); uncommon *T. ciliaris*
 2. Medulla C-, UV+ white (alectoronic acid); rare *T. americana*

Tuckermannopsis americana (Spreng.) Hale

[TUCAM] - foliose

Rare; known only from lower boles of *Pinus echinata* in a small region of Shannon County, where it is significantly disjunct from its main range in the mixed and coniferous woodlands of the Great Lakes region. All of our populations are associated with remnant old growth *Pinus echinata* woodlands, although it has been collected on *P. echinata* in an older planting next to an old growth stand. [alectoronic acid]

Tuckermannopsis ciliaris (Ach.) Gyeln.

[TUCCI] - foliose

Uncommon on *Pinus echinata* in areas of extensive mature woodland, growing on boles, branches, and even old stumps. [olivetoric acid]

Tuckermannopsis fendleri (Nyl.) Hale

[TUCFE] - foliose

Occasional on lightly shaded to exposed boles and branches of *Pinus echinata*, including young trees along roadsides and woodland edges in areas of extensive oak-pine woodlands. More rarely it grows on old, undetached pine cones. This species sometimes grows on *Pinus echinata* boles in older plantations that were planted by the Civilian Conservation Corps during the 1930's. The thallus is typically chestnut brown, and turns deep yellowish green when wet. [fatty acids]

USNEA Dill. ex Adans. (Parmeliaceae)

Slender, terete, abundantly branched, yellowish-green fruticose lichens, if fertile with pale tan terminal apothecia, thalline margin present, often with corticate fibrillose projections, photobiont *Trebouxia*, asci *Lecanora*-type, with 8 small, simple, hyaline spores; 6 species in the region.

1. Thallus lacking isidia and soredia, although sometimes with abundant fine fibrils.
 2. Thallus pendulous, >8 cm long, with remote branching; not fibrillose *U. trichodea*
 2. Thallus compact, erect, <8 cm long, with frequent branching; smooth or more commonly fibrillose
..... *U. strigosa*
1. Thallus sorediate or sorediate-isidiate.
 3. Medulla K-.
 4. Diffractaic acid lacking; common *U. mutabilis*
 4. Diffractaic acid present; rare *U. ceratina*

3. Medulla K+ yellow or red.

5. Usually corticolous; medulla K+ yellow (stictic acid) *U. rubicunda*

5. Saxicolous; medulla K- or K+ red (galbinic acid \pm norstictic acid) *U. cf. amblyoclada*

Usnea cf. amblyoclada (Müll. Arg.) Zahlbr.

[UNSAM] - fruticose

Sporadically distributed but sometimes locally frequent, on massive exposures of siliceous rocks in natural areas, typically in high light intensities with rapid drainage or protection from wetting. Substrates include granite, rhyolite, and sandstone. This entity, formerly called *U. herrei*, is taxonomically problematical in the Interior Highlands. Local material often has some reddish coloration near the base, with the lateral branches somewhat narrowed at their attachment points. All specimens contain galbinic, norstictic, and usnic acids. According to Clerc and Herrera-Campos (1997), *U. amblyoclada* contains salazinic acid in addition to norstictic, usnic, and sometimes galbinic acids. Unfortunately, Clerc and Herrera-Campos' treatment does not evaluate a representative suite of North American material, particularly material from the lower Midwest. [galbinic, norstictic, & usnic acids]

Usnea ceratina Ach.

[USNCE] - fruticose

Rare on shaded lower boles and bases of trees in mature woodlands, usually occurring singly. [diffractaic & usnic acids]

Usnea mutabilis Stirt.

[USNMU] - fruticose

Frequent but scattered in the region, occurring in mature woodlands. It occurs on a wide variety of hardwoods, especially species of *Quercus*, and is also common on *Pinus echinata*. It also grows on decorticate logs and shaded chert and sandstone boulders in wooded uplands. This is by far the most common sorediate species of *Usnea* in the region. [usnic acid]

Usnea rubicunda Stirt.

[USNRU] - fruticose

Uncommon and local, on lightly shaded tree boles in remnant natural areas. This species apparently requires areas with a long history of stability, and is found in extensive, mature woodlands that have not become excessively overgrown through fire suppression. Although it typically occurs on *Quercus*, it also grows on a wide variety of other trees such as *Carpinus caroliniana*, and occasionally even on lightly shaded siliceous rocks. The distinctive red cortex near the base of the thallus permits easy field identification. [stictic & usnic acids; \pm norstictic acid?]

Usnea strigosa (Ach.) Eaton

[USNST] - fruticose

Locally abundant in extensive woodlands; the most common and widely distributed *Usnea* in the Interior Highlands. This species is a major component of the canopy lichen vegetation in mature wooded uplands, typically associating with *Buellia stillingiana*, *Hypotrachyna livida*, *Myelochroa galbina*, and *Vulpicida viridis*. It also occurs on shaded tree boles and well-drained logs, particularly on *Quercus coccinea*, *Q. marilandica*, and *Q. velutina*. Rare individuals grow on lightly shaded chert or sandstone boulders in wooded uplands. The chemistry of this species is extremely variable. Locally, the following chemotypes are known: 1) usnic and psoromic acids; 2) usnic, fumarprotocetraric, and psoromic acids; 3) usnic, galbinic, and psoromic acids; 4) usnic acid only. The overwhelming majority of our material is the usnic and psoromic acid chemotype (1). South of our area are populations with usnic and norstictic acid. Tavares (1987) has delineated a number of elements within this complex, but local material does not appear to be morphologically and chemically correlated along the proposed segregations. [usnic acid, \pm fumarprotocetraric, galbinic, norstictic, and psoromic acids]

Usnea trichodea Ach.

[USNTR] - fruticose

Rare; restricted to lightly shaded old growth populations of *Juniperus virginiana*, usually on bluffs above permanent water sources. Well-developed populations can festoon the branches of the host tree. [diffractaic or constictic acid, usnic acid, \pm barbatic acid]

VERRUCARIA Schrad. (Verrucariaceae)

Crustose, mostly saxicolous lichens with endolithic, continuous, or areolate thalli and immersed to subsessile perithecia which in some species inhabiting carbonate rock are imbedded in pits in the rock, photobiont various unicellular algae, including *Myrmecia*, *Trebouxia*, and chlorococcoid algae, asci like those of *Verrucaria*, with 8 hyaline, ellipsoid, simple spores; at least 7 species in the region. The following treatment is tentative and relies on the insights and perceptions of Richard Harris, although my interpretations may be flawed. My species concepts are still evolving, so habitat, distribution, and abundance information is sketchy.

1. On carbonate rocks, substrate HCl+ effervescent.
 2. Thallus dark colored, brown to brownish gray, \pm thick, rimose to areolate; medulla black or pale.
 3. Medulla pale *V. nigrescentoidea*
 3. Medulla black.
 4. Thallus dark gray to brownish gray; usually with 5 or more perithecia per areole *V. fayettensis*
 4. Thallus brown to dark brown, often locally suffused blackish; perithecia 1 to few, prevailing <5, per areole.
 5. Perithecia mostly <0.17 mm broad, typically 3-4 per areole; spores up to 19 μ m long [*V. fuscella*]
 5. Perithecia mostly >0.17 mm broad, typically 1-2 per areole; spores 19-28 μ m long *V. nigrescens*
 2. Thallus light colored, whitish to sordid or grayish, or tinged purplish, thin, endolithic to continuous; medulla pale.
 6. Thallus whitish, sordid, or gray.
 7. Exciple and/or clypeus black, forming a complete, dark "wall" of the perithecia.
 8. Perithecia not immersed in pits in rock, or sometimes partially immersed *V. calkinsiana*
 8. Perithecia immersed in pits in the rock, often with the top of the perithecium below the rock surface.
 9. Thallus thin, whitish or endolithic; clypeus forming a small apical disk; spores usually not developed *V. baldensis*
 9. Thallus not evident; clypeus absent or fused with exciple; spores usually present *V. calciseda*
 7. Exciple hyaline; clypeus black, the apparent wall thus lacking at the base of the perithecia *V. muralis*
 6. Thallus, and particularly the perithecia, tinged with pink or purplish [*V. marmorea*]
 1. On siliceous rocks, substrate HCl- *V. sp. # 1*

Verrucaria baldensis A. Massal.

[VERBA] - crustose

This species occurs on lightly to moderately shaded massive dolomite exposures. It has previously been confused with *V. calciseda*, so local abundance and distribution are uncertain.

Verrucaria calciseda DC.

[VERCAS] - crustose

This species occurs on well-drained or sheltered, exposed to lightly shaded, massive dolomite. See comment under *V. baldensis*.

Verrucaria calkinsiana Servit

[VERCAK] - crustose

Occasional on exposed dolomite in glades, typically occurring on smaller fragments and cobbles, although sometimes growing on more massive boulders and ledges.

Verrucaria faye ttensis Servít

[VERFA] - crustose

Uncommon on lightly shaded, massive dolomite outcrops and ledges; often in somewhat mesic habitats, such as ledges along streams in ravines.

[Verrucaria fuscella (Turner) Winch]

[VERFU] - crustose

Infrequent in parts of the Ozarks immediately north of our region, growing on shaded dolomite on wooded upland slopes and in overgrown glades. Richard Harris has speculated that this species may be the same as *V. glaucina* auct.

[Verrucaria marmorea (Scop.) Arnold]

[VERMA] - crustose

Occasional on massive dolomite exposures in glades and bluff exposures, typically growing on small loose rocks lying on massive bedrock exposures. This species is locally frequent in the huge dolomite glades of the White River region of the western Missouri Ozarks, and occurs infrequently eastward to just northwest of the Lower Ozark region. It has not yet been documented from the region, but almost certainly occurs here. The pink to purplish thallus and perithecia are distinctive, but see comments under *Thelidium incavatum*.

Verrucaria muralis Ach.

[VERMU] - crustose

Apparently uncommon on exposed dolomite in glades and on very lightly shaded ledges and outcrops.

Verrucaria nigrescens Pers.

[VERNIS] - crustose

Known from lightly to moderately shaded dolomite.

Verrucaria nigrescentoidea Fink

[VERNIT] - crustose

Occasional on mesic, typically mossy, dolomite escarpments.

Verrucaria sp. # 1

[VERSPI] - crustose

Frequent on exposed to lightly shaded, small siliceous pebbles and cobbles of chert and, less commonly, sandstone. This species has a thin, dull, grayish olive, continuous to rimose-areolate thallus, without any visible prothallus, with abundant, evenly distributed, sessile black perithecia with tiny pale apical ostioles. The perithecia are about 0.15 mm broad, with a fairly wide, flat marginal zone that somewhat abruptly rises to a subconical center. The spores are narrowly ellipsoid and fairly thick-walled, with slightly irregular outlines, and average $18-20 \times 6.4-7.5 \mu\text{m}$; they are contained in broadly rounded asci that are typically $60 \times 35 \mu\text{m}$.

VULPICIDA Mattsson & M. J. Lai (Parmeliaceae)

Loosely adnate, corticolous foliose lichens with yellowish green upper cortex and bright yellow medulla, usually with abundant marginal black pycnidia, lower cortex pale to tan, sparsely rhizinate, apothecia sessile and usually marginal, with well-developed thalline margin, photobiont *Trebouxia*, asci *Lecanora*-type, with 8 hyaline, ellipsoid, simple spores; 1 species in the region.

Vulpicida viridis (Schwein.) Mattsson & M. J. Lai

[VULVI] - foliose

Common on upper canopy branches in extensive mature wooded uplands, and occasionally on lightly shaded boles and lower branches, usually growing on *Quercus*, but also documented from *Ulmus*, *Fraxinus*, and a few other species. This species is especially common on trees of *Quercus* section *Erythrobalanus* (the red and black oak group), including *Q. coccinea*, *Q. marilandica*, *Q. rubra*, and *Q. velutina*. [vulpinic acid]

XANTHOPARMELIA (Vain.) Hale (Parmeliaceae)

Large yellowish green foliose lichens containing usnic acid in the upper cortex, apothecia sessile, brown, with a thalline margin, photobiont *Trebouxia*, asci *Lecanora*-type, with 8 simple, hyaline, ellipsoid spores; 7 species in the region. Reference: Hale (1990).

1. Thallus isidiate, the isidia laminal, fine and cylindrical *X. subramigera*
1. Thallus without isidia.
 2. Lower cortex prevailingly jet black, sometimes with a dark brown marginal zone.
 3. Medulla K-, P+ red, fumarprotocetraric acid present *X. hypomelaena*
 3. Medulla K+ yellow or yellow turning red, P+ orange (fumarprotocetraric acid absent).
 4. Salazinic acid present, stictic acid absent *X. tasmanica*
 4. Salazinic acid absent, stictic acid present *X. angustiphylla*
 2. Lower cortex whitish to tan or pale brown nearly throughout, occasionally becoming somewhat darker brown at the very center.
 5. Salazinic acid present *X. somloensis*
 5. Salazinic acid absent.
 6. Lobes apically broadened, often imbricate and laciniately divided *X. cumberlandia*
 6. Lobes linear throughout, not imbricate or laciniately divided *X. neotaractica*

Xanthoparmelia angustiphylla (Gyeln.) Hale [XANAN] - foliose
 Frequent throughout the Ozarks, although apparently somewhat less common in the Lower Ozark region than elsewhere in the Interior Highlands. This species typically occurs on exposed sandstone. [constictic, norstictic, stictic, & usnic acids]

Xanthoparmelia cumberlandia (Gyeln.) Hale [XANCU] - foliose
 Locally frequent on exposed siliceous rocks, and also growing in lightly shaded xeric areas, such as on sandstone or chert boulders on sparsely wooded ridges. This species also grows on lightly shaded, weathered asphalt shingles. [constictic, norstictic, stictic, & usnic acids]

Xanthoparmelia hypomelaena (Hale) Hale [XANH] - foliose
 Infrequent on exposed to lightly shaded, siliceous substrates in well-drained to xeric sites. South and west of the region, some populations otherwise referable to this species appear to contain protocetraric acid instead of fumarprotocetraric acid. [fumarprotocetraric, succinprotocetraric, & usnic acids, ± traces of physodalic acid]

Xanthoparmelia neotaractica Hale [XANNE] - foliose
 Known from a single locality on exposed igneous rocks in Shannon County. This species is said to be less tightly adnate than *X. cumberlandia*. In my experience, even within *X. cumberlandia* there is a bewildering array of degrees of adnate that appear to be somewhat controlled by substrate characteristics. [constictic, norstictic, stictic, & usnic acids]

Xanthoparmelia somloensis (Gyeln.) Hale [XANSO] - foliose
 Occasional on well-drained siliceous substrates, apparently with a predilection for lightly shaded boulders in uplands and along naturally occurring edges of woodlands. [consalazinic, norstictic, salazinic, & usnic acids, ± lobaric acid]

Xanthoparmelia subramigera (Gyeln.) Hale [XANSU] - foliose
 Frequent on exposed to lightly shaded siliceous substrates, occurring on both massive exposures and smaller boulders of chert, sandstone, and igneous rocks. This species can be readily identified in the field by the abundant, fine, cylindrical, laminal isidia and pale lower cortex. Three other isidiate species approach the region. *Xanthoparmelia mexicana* (Gyeln.) Hale, occurring west of the region, also has a pale lower cortex but contains norstictic and salazinic acids and reacts K+ yellow turning reddish in the medulla, as opposed to the K- medullary reaction of *X. subramigera*. The other two species have black lower cortices and contain norstictic and stictic acids: *X. conspersa* (Ehrh. ex Ach.) Hale has short, somewhat irregular lobes, while *X. isidiascens* Hale has more elongate, linear lobes. *Xanthoparmelia conspersa* is known from a few records in the extreme eastern Ozarks, slightly northeast of the region, while *X. isidiascens* is known from literature reports just east and

north of the Lower Ozarks. [fumarprotocetraric & usnic acids, ± physodalic acid, ± succinprotocetraric acid]

Xanthoparmelia tasmanica (Hook. f. & Taylor) Hale [XANTA] - foliose
Occasional on exposed to lightly shaded siliceous boulders. [salazinic & usnic acids, ± consalazinic acid, ± norstictic acid, ± traces of protocetraric acid]

XANTHORIA (Fr.) Th. Fr. (Teloschistaceae)

Small orange to bright deep yellow sorediate foliose lichens with abundantly branched lobes and pale lower cortex, apothecia sessile, with well-developed thalline margin, photobiont *Trebouxia*, asci *Teloschistes* type, with 8 hyaline polarilocular spores; 2 species in the region. Reference: Lindblom (1997).

1. Thallus lobes <0.2 mm broad, prevailing ca. 0.2 mm broad; soralia marginal and terminal, <0.4 mm long; thallus often loosely adnate, with ± erect lobe tips *X. fulva*

1. Thallus lobes prevailing >0.5 mm broad; soralia primarily labriform and marginal, >0.5 mm long; thallus closely adnate, with appressed lobe tips *X. fallax*

Xanthoria fallax (Hepp) Arn. [XANFA] - foliose
Uncommon on trees and sometimes rocks, in exposed, often disturbed, sites. This species is more common in the prairie areas north and west of the Ozarks, but appears to be an uncommon (and perhaps recent) component of the contiguous woodland area of the Lower Ozarks. [parietin]

Xanthoria fulva (Hoffm.) Poelt & Petutschnig [XANFU] - foliose
Occasional in sites with high light intensities, such as rocks along the margins of glades and boles of solitary trees in glades, pastures, and along roadsides. This species is distinctive because of its golden orange color and minute, abundantly branched lobes. Specimens in heavily shaded sites are more greenish yellow in color, and may superficially resemble *Candelaria concolor*, from which they may be distinguished by the K⁺ deep magenta cortex of *Xanthoria*, versus the K⁻ (or weakly orange-redish) cortex of *Candelaria*. [parietin]

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